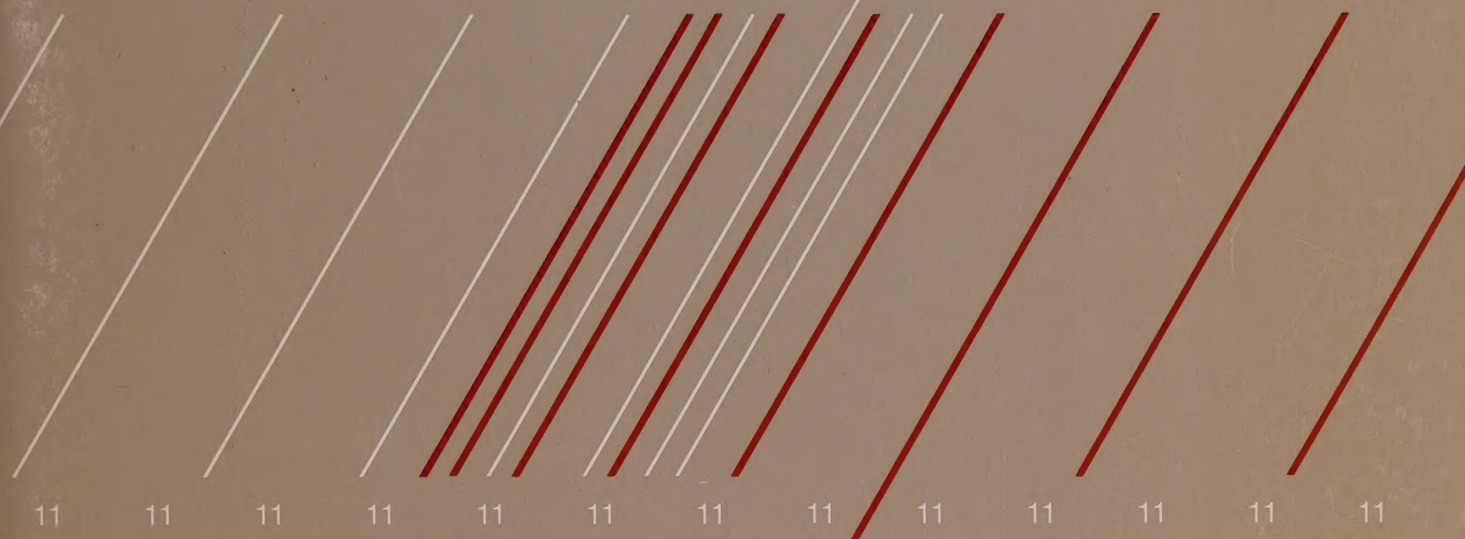
The Ontario
Task Force on
Employment and
New Technology



Employment and New Technology in the Plastic Processing Industry

An Appendix to the Final Report

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

Co-Chairmen of the Task Force

WILLIAM B. BOGGS
Chairman and President, The de Havilland Aircraft of Canada Ltd.

ROBERT WHITE
Director for Canada, United Auto Workers Union

Members of the Task Force

RALPH BARFORD
Chairman, Valleydene Corporation Ltd.

JALYNN BENNETT
Investment Vice-President, The Manufacturers Life Insurance Co.

LUCIE NICHOLSON
President, Ontario Division, Canadian Union of Public Employees

FRED POMEROY
President, Communications Workers of Canada

THOMAS ARMSTRONG
Deputy Minister, Ontario Ministry of Labour

BENSON WILSON
Chairman, Ontario Manpower Commission

Staff

Richard Brown, Research Director

Stanley But

Hildegard Martens

APPENDIX 11

EMPLOYMENT AND NEW TECHNOLOGY

IN THE PLASTIC PROCESSING INDUSTRY

This Appendix contains a report prepared for the Ontario Task Force on Employment and New Technology. The topic was approved in advance by the Task Force. At the conclusion of the study, the Task Force had the opportunity to review the report, but its release does not necessarily imply endorsement of the results by the Task Force or its individual members.

ISBN: 0-7729-0481-2

Additional copies of this and other Ontario Government publications are available from:

The Ontario Government Bookstore, 880 Bay Street, Toronto for personal shopping. Out-of-town customers write to Publications Services Section, 5th Floor, 880 Bay Street, Toronto, M7A 1N8. Telephone (416) 965-6015. Toll free long distance 1-800-268-7540, in area code 807 dial 0-Zenith 67200. Mastercard and Visa accepted. Cheques and money orders payable to the Treasurer of Ontario. Prepayment required.

FOREWORD

The Ontario Task Force on Employment and New Technology, a joint labour-management group, was established in May, 1984, "to consider and report on the manpower and employment implications of new technologies as the same may be introduced and applied in Ontario during the next decade and the extent and nature thereof."

To inform its discussions, the Task Force established a research agenda designed to gather information on employment and technological change from a wide variety of sources. The research agenda contained projects which gathered information of a historical nature, and projects with a future orientation which were designed to gather information describing likely occupational and employment implications associated with technological change in the 1985-1995 period.

The Appendices to the Final Report of the Ontario Task Force on Employment and New Technology contain reports of these research projects. A complete list of these Appendices may be found at the end of this document.

Among the Appendices are reports of a series of studies to assess the extent and nature of the employment implications of new technology in selected industries in Ontario. Appendix 3 describes the process by which the industries were selected, and contains the studies' terms of reference which called for particular attention to selected new technologies and occupational groups. Appendices 4-18 contain reports of these industry studies, which were conducted by Currie, Coopers & Lybrand, management consultants.

This particular appendix contains a report of the study on the Plastic Processing Industry.

Dr. Richard L. E. Brown, P.Eng.
Research Director

ACKNOWLEDGEMENTS

The Ontario Task Force on Employment and New Technology has been generously supported by financial contributions from:

The Board of Industrial Leadership and Development (BILD) of the Government of Ontario.

The Ontario Manpower Commission.

The Ontario Ministry of Labour.

The Task Force would like to thank the staff of Currie, Coopers & Lybrand, particularly Maureen Farrow and Victor Rocine, whose assistance in the conduct of this study is greatly appreciated.

Special thanks are due to all industry experts and survey respondents who provided information for this study.

EMPLOYMENT AND NEW TECHNOLOGY IN THE PLASTIC PROCESSING INDUSTRY

A Report Prepared by Currie, Coopers & Lybrand
for the Consideration of the Ontario Task Force
on Employment and New Technology

July 1985

Submitted By: Maureen Farrow
Judith Maxwell

Currie, Coopers
& Lybrand
Management
Consultants

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF EXHIBITS

LIST OF TABLES

EMPLOYMENT AND NEW TECHNOLOGY IN THE PLASTIC PROCESSING INDUSTRY

PART I - INTRODUCTION AND METHODOLOGY

1.0 INTRODUCTION

This report is one of a series of industry reports which summarize the findings of a major research project[1] undertaken for the Ontario Task Force on Employment and New Technology. Each report includes a historical analysis and an outlook to 1995 for the industry, and a review of the anticipated impacts of new technology on employment.

1.1 Structure of This Report

This report presents the study findings for Ontario's Plastic Processing Industry (SIC 165)[2]. The report includes four parts.

- The first part (Chapter 1.0) is the Introduction which includes a description of the approach and methodology.

- The second part (Chapter 2.0) is a Historical Analysis for the industry from 1971 to 1984 which provides background and a perspective on the industry's historical development.

- The third part (Chapters 3.0 to 7.0) discusses the results of the survey of firms in the industry and incorporates the interview findings with industry experts. These chapters cover:

  - a review of recent and anticipated technology adoptions,

---

[1] Manpower and Employment Implications of New Technologies in Selected Manufacturing Industries in Ontario to 1995. The terms of reference of this assignment can be found in Appendix 3 to the Task Force's final report.

[2] 1970, Standard Industrial Classification (SIC), Statistics Canada.

- the outlook for the industry to 1995, including expected output and employment levels,

- effects on employment of new technology such as anticipated occupational shifts and changes in required skills,

- a review of the labour relations environment as it relates to new technology, and

- observations on planning efforts for technological change in the industry.

- Part four of the report includes various appendices that support the text of individual chapters.

1.2 Study Approach

The study approach selected incorporates the following research techniques:

- analysis of published statistics and reports on the industry, augmented by the working knowledge of industry specialists within Currie, Coopers & Lybrand,

- in-depth interviews with management and labour experts in the industry, conducted at various stages in the project, using structured interview guides, and

- an industry survey.

The reasons for the choice of these techniques are explained below.

1.2.1 Historical Analysis

The purpose of the historical analysis was to provide an informed perspective on the industry from which to view future trends. The historical analysis covers: the economic environment, competitive factors, output and employment patterns, productivity, technology adoption and the industrial relations environment. In order to permit cross industry analysis, consistent indicators and data sources were used.

1.2.2 Expert Interviews

At various stages in the project, a series of in-depth interviews were conducted with industry leaders, industry associations and union representatives. These experts have a broad understanding of the industry in terms of both its historical development and its future outlook. Their input assisted in the preparation of the historical analysis and in the survey design, and facilitated a clearer interpretation of the survey results.

1.2.3 Sample Survey of Firms

The following describes the key features of the survey.

Ontario firms in the Plastic Processing Industry were identified using the 1982 Census of Manufacturers.[1] All

[1] Manufacturing Industries of Canada: National and Provincial Areas, 1982, Statistics Canada, Catalogue No. 31-203.

firms with twenty (20) or more employees were included in the sample frame. Employment in these firms is estimated to include 98 percent of the 19,218 employees (1982) in the Plastic Processing Industry in Ontario.

The total number of firms in the industry in 1982 was 196, of which 169 had twenty or more employees. This latter group of firms, with twenty or more employees, was the base for selecting a sample of firms for the survey. Table 1 shows the number of firms in the sample frame, by size. There were no large firms, that is, with five hundred or more employees, in Ontario in 1982.[1]

A representative, random sample of firms, stratified by employment size categories (see Appendix A), was chosen from the sample frame. The senior executive officer of each firm was identified and a structured questionnaire was sent to this individual.

A search was carried out of the Ontario Ministry of Labour Collective Agreements Library to identify unions in the sample firms. Union head offices were contacted to identify the appropriate union leader in each of the unionized firms in the sample. The same questionnaire was

[1] The number of firms should not be confused with the number of establishments (454 in 1982). Establishments are production centres. Therefore, a firm may have more than one establishment.

sent to union representatives. A copy of the survey questionnaire is attached as Appendix B together with an outline of the number of responses by question.

Consultants provided ongoing assistance to respondents, both on the telephone and in person, to complete the questionnaires. The questionnaire survey process generally ended with a personal interview. The number of firms and unions who participated in the sample survey are shown in Table 1, below.

TABLE 1: PLASTIC PROCESSING

Number of Firms and Unions Responding
By Firm Employment Size

Firms by Employment Size	Firms	Unions	Firms in Sample Frame (1)
Small (20-99)	4	2	117
Medium (100-499)	9	2	52
Large (500+) (2)	0	0	0
Total Firms	13	4	169

(1) SOURCE: Statistics Canada, CENSUS OF MANUFACTURERS, 1982.
(2) In SIC 165 there were no firms employing 500 or more employees.

In most cases, several participants in each organization contributed to the completion of a questionnaire. In the Plastic Processing Industry survey, an average of 1.7 participants contributed to a firm questionnaire and 1.3 participants to a union questionnaire. The companies' principal participants had an average of 13 years' experience with their firms and 18 years in the industry. The unions' principal participants had an average of 16 years experience with their firms and 16 years in the industry.

The sample survey results have been weighted up to the number of firms in the sample frame. That is, the survey results reported herein refer to the weighted survey results and are, therefore, representative of firms with twenty or more employees in the Plastic Processing Industry (SIC 165) in Ontario.

The reliability for the sample for the Plastic Processing Industry is estimated at 99 percent with a 5 percent allowable error. See Appendix C for an explanation of the sample reliability calculation method.

Readers should be cautioned about the nature and reliability of the sample survey results. The questionnaire included a set of questions asking respondents about the future (i.e., five and ten years ahead) from a particular point in time. The results are, therefore, a representative sample of views about, and expectations for, the future and should not be viewed as what will necessarily take place. The survey provides a useful perspective from which to better understand how the industry perceives the future of new technology adoption and its anticipated impacts on employment.

The next chapter of the report discusses the historical analysis and subsequent chapters review the results of the sample survey and expert consultation which discuss the anticipated trends for the period 1985 to 1995.

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

This section of the report provides an historical analysis of the Plastic Processing Industry trends for the period 1971 to 1981 and 1982 to 1984.

There were 454 establishments in the Ontario Plastic Processing Industry (SIC 165) in 1982. They generated $1.5 billion in shipments that year, about 63 percent of total output in Canada. The industry is composed of a large number of small and medium sized plants; none of them employ much more than 500 employees and the majority employ less than 100. Total employment in 1982 amounted to 19,218.

2.1 The Structure of the Industry

The Plastic Processing Industry SIC 165 includes establishments primarily engaged in using synthetic resins manufactured elsewhere to mould, extrude or otherwise fabricate basic shapes and forms of plastic or plastic articles which cannot conveniently be classified elsewhere, including synthetic sausage casings, plastic bottles and containers, plastic and fibreglass awnings. Many establishments included in this industry manufacture special plastic parts for automobiles, household appliances and the like. Establishments primarily engaged in manufacturing plastic articles such as toys, buttons, tooth brushes or any other article for which provision is made elsewhere are not classified in SIC 165 but instead are classified to the appropriate industry SIC. Likewise, establishments primarily engaged in manufacturing such products as plastic film and sheet, extrusions or the like from resin of their own manufacture are classified elsewhere. Finally, establishments that are primarily engaged in other manufacturing activities but also maintain plastics fabricating operations are classified elsewhere because plastics fabricating is not their major field of activity.

Plastic products arrived on the market in the 1950's and have recorded phenomenal increases in sales because plastic is a highly attractive [1] substitute for paper, glass, steel and aluminum. The industry is constantly developing new uses for plastic, so some product lines are still growing rapidly. However, some of the established products, such as plastic garbage bags, have now taken over a high market share. With the market reaching a high saturation rate, sales of garbage bags have slowed to the rate of increase in the volume of garbage being disposed of.

Continued penetration of new markets is likely to occur for three reasons:

- First, new forms of plastics are being developed by adding chemicals or other compounds to improve characteristics and thus to open up new uses for plastic. One emphasis now is on creating a stronger product which is resistant to high temperatures. This will facilitate more extensive use in automotive bodies and parts. Other areas of increased penetration are in construction materials, where plastics are replacing cement, metals and wood.

- Second, prices of plastic are highly competitive with aluminum and steel. This is partly due to high levels of excess capacity in the petrochemical industry worldwide and partly due to the vigorous competition among plastic fabricators.

- Thirdly, moulding and fabricating technologies are improving.

The plastic fabricator works at the end of a long chain of production which begins with the raw materials - crude oil and natural gas. The oil and gas are "cracked" to separate out

---

[1] Attractive because of a combination of price, weight, durability, lack of corrosion and other properties.

intermediate products such as ethane, which is then combined with other chemicals to produce ethylene.

Ethylene is then converted into polyethylene or polyvinyl chloride resins. All these stages of the production process are performed by the petrochemical industry, a highly concentrated industry which, in Canada, is dominated by firms like Dow Chemical Canada Inc., Union Carbide Canada Limited, Esso Chemical and Shell Chemicals. The resins are purchased by plastic fabricators, the subject of this study, which then mould, extrude or otherwise form the resins into plastic products. Table D.1 lists the major plastic resins, shows their 1983 production and then lists the major end uses of each resin. (The tables for this section of the report are presented in Appendix D, Historical Tables). Each of the resins can be used for a wide range of purposes and, for many uses, they tend to be substitutes for each other. For example, polyethylene, polypropylene and polyvinyl chloride (PVC) can all be used to make packaging films, but each is also used to make hard plastics of different qualities. PVC is dominant in the production of plastic pressure pipe, but other plastics are also used for this purpose.

Table D.2 lists some of the larger companies in Ontario, showing their main product line and an estimate of the number of employees. The table demonstrates the diversity of ownership - some firms are subsidiaries of very large companies, and some are foreign owned. But there are numerous small and medium sized companies with Canadian owners. The barriers to entry are relatively low since some production processes are not capital intensive. Raw materials - mainly the resins - account for about 55 percent of total cost and apparently resin suppliers are prepared to bankroll new fabricators in order to encourage sales.

2.2 The Market Environment

Canadian plastic fabricators are part of a global marketplace.

The resin raw materials are widely traded and resin prices are set by international forces of supply and demand. Resin prices soared in the early and mid 1970's because of global shortages of capacity and rising oil prices, but producers reacted by installing too much new capacity (not only in North America but also overseas) with the result that, since the early 1980's, there has been global excess capacity which is expected to continue until the late 1980's.

Plastic fabricators have, therefore, been assured of plentiful resin supplies and have been paying stable (at times falling) prices. The main challenges facing plastic fabricators are:

- An increase in captive production capacity. Many of the large firms that are heavy users of fabricated plastics have set up their own fabrication facilities, thus narrowing the market open to independent fabricators. Examples include some of the major oil companies. They have set up their own plants to make plastic containers for motor oil and grease. In addition, some of the major construction materials firms have set up facilities to make plastic siding and roof trusses in order not to lose a market that once used wood or aluminium materials. Auto makers have also begun to fabricate an increasing percentage of the plastic parts used in the auto industry.

- Rapidly changing technology. Changes are occurring in the resins available on the market and in the machinery used to convert the resins to plastic products. Fabricators have to be alert to both types of change in order to avoid losing their market to a competitor who has been quicker to adapt to these changes.[2]

[2] Canadian fabricators have the advantage of access to Canadian mould makers that supply some key types of equipment and have a good reputation for quality and innovation and a successful export record. Canada exported $143 million worth of dies and moulds for the plastics industry in 1983 and imported only $21 million. See Judith Nancekivell, "Canada's Moldmakers: Riding High on Craftsmanship" in Canadian Plastics, April, 1982, and Society of the Plastics Industries, Canadian Plastics Statistical Year Book, 1984, p. 3.

- Managing growth. Plastic fabricators typically start small. If they define a new market opportunity successfully, they frequently encounter a period of explosive growth once their product gains market acceptance.

- Regulation of plastic products. The most controversial regulatory problems are:

    - Recycling of products that are not biodegradable.

    - Control of chemical additives that might contaminate the contents of a plastic package during its useful life or contaminate the area where it is dumped after use.

    - Meeting fire regulations (some plastics create smoke hazards) and building codes.

Each of these concerns can inhibit the rate at which plastic products can penetrate any given market.

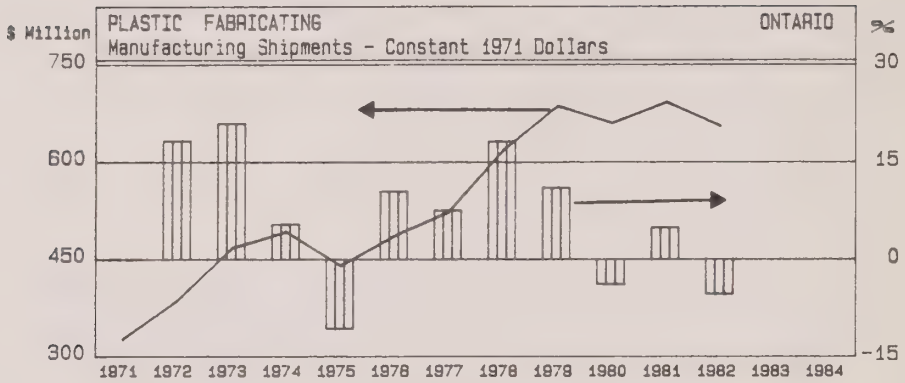
Despite the constraints created by regulation, however, the Plastic Processing Industry is a growth sector. It is not only assured of growth in line with final demand for each end use market, but also it has the potential for more rapid growth as new products are developed that will displace current uses of steel, paper, glass and aluminum.

2.3 Industry Trends

Tables D.3 to D.6 present key industry indicators for the years 1971 to 1984.

2.3.1 Aggregate Output

EXHIBIT 1



Current dollar manufacturing shipments of the Plastic Processing Industry in Ontario increased from $325.9 million in 1971 to $1,538.2 million in 1981. In 1982, manufacturing shipments declined by 0.3 percent to $1,533.3 million in current dollars.

In constant 1971 dollars, manufacturing shipments of the Plastic Processing Industry increased from $325.9 million in 1971 to $691.0 million in 1981. Thus, during the period 1971 to 1981, manufacturing shipments grew in volume terms at an average annual rate of 7.8 percent in Ontario (Tables D.3 to D.6). The pattern of growth in manufacturing shipments was relatively smooth throughout the decade with the exception of a temporary sharp downturn in 1975 and another smaller but significant decline in 1980. These downturns reflected soft market conditions following the oil price increases and the subsequent general economic slowdowns of 1974-1975 and 1979-1980.

Since the end of the 1970's, growth rates in the Ontario Plastic Processing Industry have been subdued, reflecting the fact that the industry is maturing and there is worldwide overcapacity in the industry. At the same time, the rising costs of feedstocks and the slowing of the

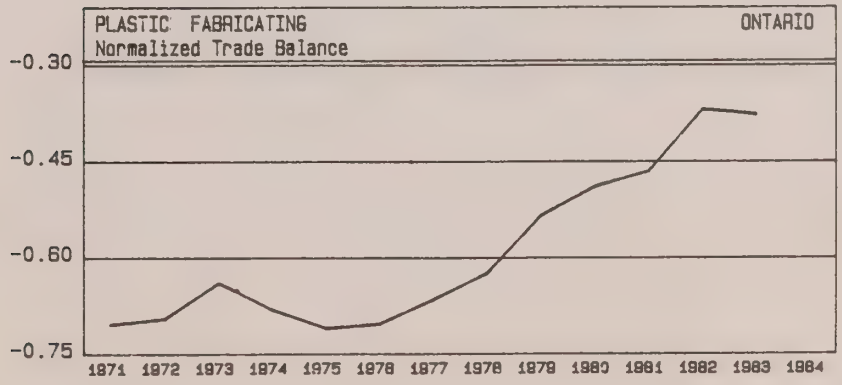
world economy in 1981-1982 contributed to the slowdown. As a result, plastics growth has more closely followed fluctuations in GNP in recent years than in previous decades when double digit real growth rates were the norm.

In 1982, the latest year for which there is industry data, manufacturing shipments of the Plastic Processing Industry declined by 5.4 percent in volume terms from $691.0 million in 1981 to $653.9 million in 1982.

2.3.2 Competitive Position

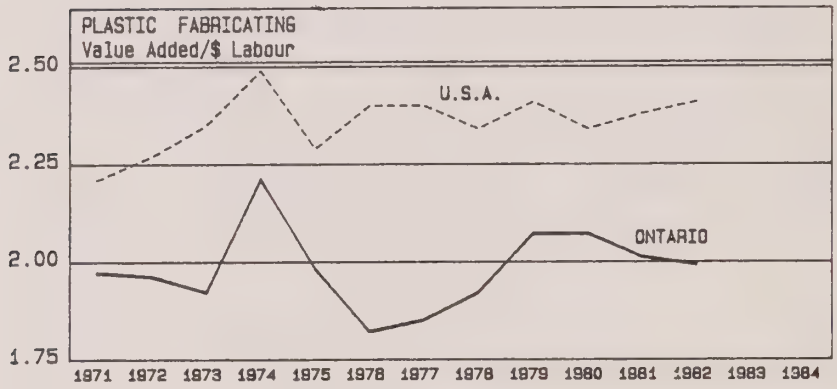
Since 1971, the value of Ontario imports of fabricated plastics has exceeded the value of exports; however, Ontario's normalized trade balance (exports minus imports divided by exports plus imports) improved dramatically over the 1970's. The improvement in the normalized trade balance indicates that Ontario's negative trade balance as a percent of total trade has been declining. While in 1971 imports exceeded exports by nearly a six to one ratio, by 1983 imports exceeded exports by only a two to one ratio. An increase in fabricating capacity and the introduction of a number of new products and processes allowed the Ontario Plastic Processing Industry to become more self sufficient over the 1970's.

EXHIBIT 2



The performance of Ontario's Plastic Processing Industry can be compared to the industry in the United States based on an analysis of value added per dollar of labour. Exhibit 3 below indicates that in Ontario, value added per dollar of labour fluctuated between 76 and 89 percent of the United States figure for the period 1971 through 1982. The smallest differential occurred in 1971 while the largest differential was recorded in 1976 and 1977.

EXHIBIT 3



The reasons for the gap between Ontario and the United States are not clear but may include higher raw material costs and/or lower productivity in Ontario compared to the United States. As well, it has been suggested that tooling costs might be higher in Canada than in the United States because Canadian plants produce a greater variety of products. This variety could cause output for an equivalent production machine to be lower in Canada due to the downtime for tooling changes and due to a lower experience factor on each individual product.

From an international perspective, the Canadian Plastic Processing Industry had a sizeable and potentially growing raw material cost advantage in the 1970's because of a strong natural gas position. This competitive advantage spurred the expansion of the resin and plastics fabricating industries in the 1970's and encouraged a dependency on exports to the United States and the Pacific Rim. In the wake of the worldwide recession of 1981-1982, the problems of worldwide overcapacity and declining prices were compounded by the fact that energy and feedstock costs continued to rise in Canada because of rigid Canadian regulations that forced a movement to world energy price levels. Meanwhile, the same costs stayed level or declined elsewhere in the world. The Ontario industry was thus faced with severe world overcapacity, reduced growth expectations and the loss, at least temporarily, of the Canadian feedstock cost advantage.

2.3.3 Capital Investment

Capital investment statistics are only available for Canada as a whole for SIC 165; however, in 1982, Ontario based manufacturers of fabricated plastics accounted for 63.2 percent of Canadian shipments of these products.

In current dollars, total capital spending by the Plastic Processing Industry increased from $25.0 million in 1971 to $76.3 million in 1981. From 1982 to 1984, capital spending declined from 1981 levels to $70.1 million in 1982 then increased further to an expected $114.3 million in 1984.

Capital spending in constant 1971 dollars by the Plastic Processing Industry rose to a temporary high of $40.9 million in 1973 and then fell off through the mid 1970's before rising to a peak for the decade of $46.7 million in 1979. Through the early 1980's, real capital spending

remained subdued, recording year over year declines. In 1983, a constant 1971 dollar increase of 8.2 percent was finally recorded after three years of declines. In 1984, real capital investment is expected to accelerate - although the construction component is expected to decline, the machinery and equipment component is forecast to record a 45 percent year over year increase in real terms.

The pattern of capital spending for the construction and machinery and equipment components varied somewhat through the 1970's and early 1980's. In the 1970's, capital investment was largely driven by spending on machinery and equipment. The latter increased from $19.3 million in 1971 to $62.9 million in 1981, in current dollars. By comparison, spending on construction increased from $5.7 million to $13.4 million from 1971 to 1981.

Machinery and equipment investment continued to be considerably larger than construction spending in the period from 1982 to 1984. Current dollar machinery and equipment spending increased from $62.2 million in 1982 to an expected $104.5 million in 1984. The corresponding figures for construction spending were $7.9 million and $9.8 million.

EXHIBIT 4

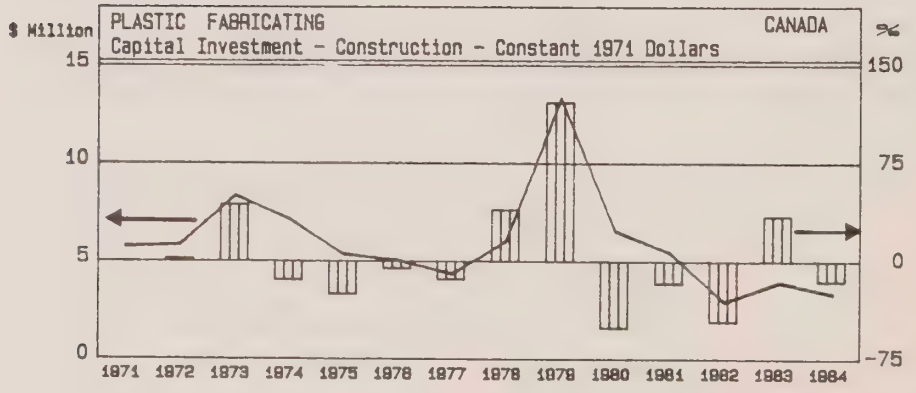


Exhibit 4 above indicates that real construction activity reached a peak of $13.3 million in 1979, increasing 122 percent over already respectable 1978 levels. Since that time, construction spending has continued to record year over year declines with the exception of a temporary upturn in 1983.

EXHIBIT 5

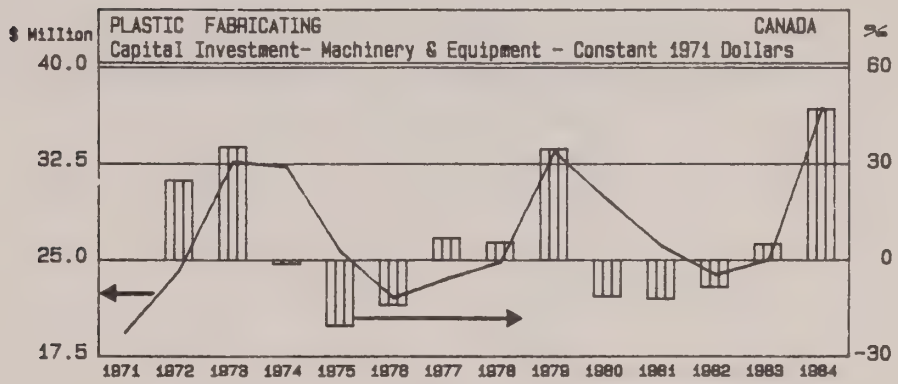


Exhibit 5 indicates that real spending on machinery and equipment reached a temporary peak in 1979 at a level of $33.4 million before recording moderate year over year declines through 1982. In 1983, real machinery and equipment spending turned sharply upward again and will reach an expected peak for the period in 1984 at $36.8 million.

The reason for the weakness in construction spending in recent years includes low capacity utilization rates and the high debt burdens of plastics fabricators, thus forcing the cancellation of many capital expansion projects. Instead, fabricators have been investing in the efficiency improvements and productivity gains that can be realized through upgrading machinery and equipment. Thus, machinery and equipment spending increased at the expense of construction spending in 1983 and 1984.

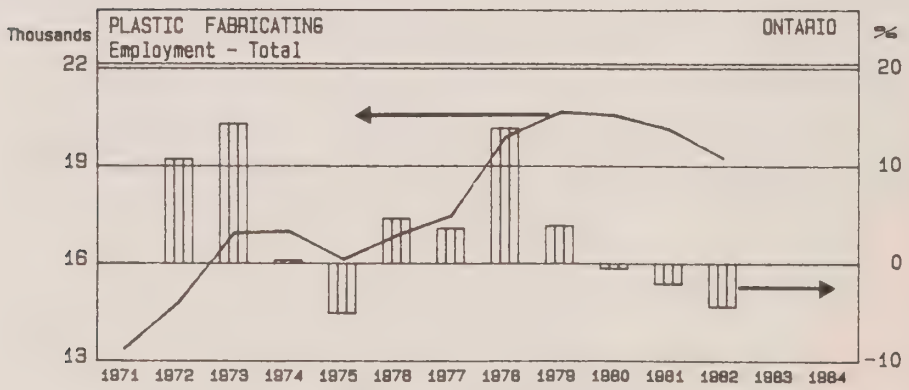
2.3.4. Employment

The discussion of employment includes an analysis of aggregate trends and occupational changes.

- Aggregate Trends

  In this section of the report two sources of employment data are used in order to provide the level of analysis required. Total employment trends are taken from Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. This data series is based on the Census of manufacturing industries conducted by Statistics Canada annually. This data series is used as it shows the year to year trend in total employment. In order to analyze the employment trends by occupation, the census of Canada has been used. However, this data is only available for the census years 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

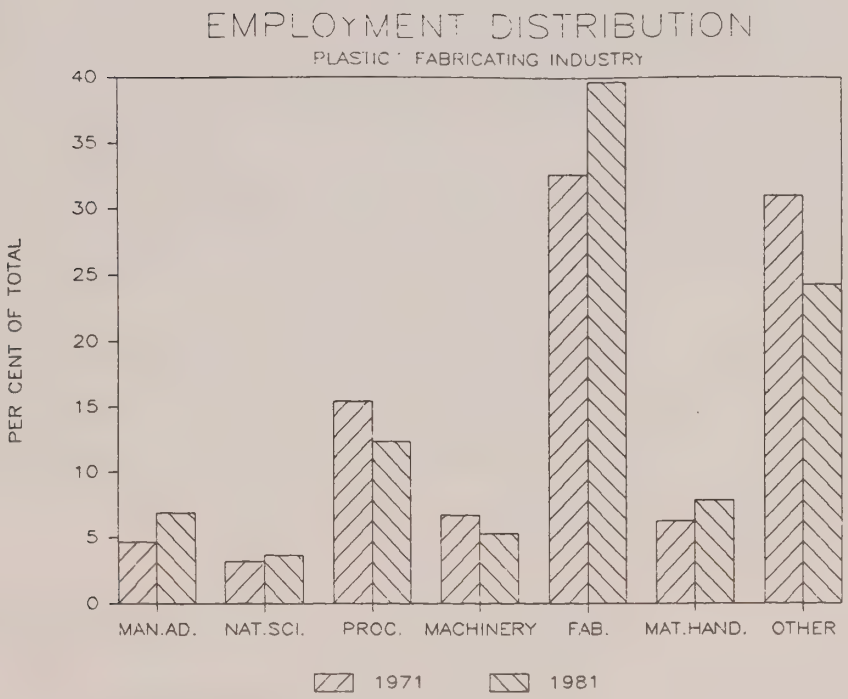
EXHIBIT 6



Total employment in the Plastic Processing Industry in Ontario grew at an average annual rate of 4.2 percent over the 1971-1981 period. Small declines were experienced in 1980 and 1981 followed by a larger decline of 4.4 percent from 1981 to 1982. In 1982, there were 19,218 employees in the industry compared with 13,360 in 1971. The data is shown in Tables D.3 to D.6.

- Occupational Changes

EXHIBIT 7



The census data for Ontario show that total employment increased by 6.4 percent per annum over the 1971 to 1981 period. The occupational groups showing the most rapid average annual growth between 1971 and 1981 were Managerial, Administrative and Related, Material Handling and Related and Product Fabricating, Assembling and Repairing. These occupations grew at average annual rates of 10.4, 8.7 and 8.4 percent respectively from 1971 to 1981.

Product Fabricating accounted for almost 40 percent of all jobs in 1981 as indicated in the above chart. The occupational groups which reduced their share of total employment were Machining and Related and Processing; however, they did grow at average annual rates of 4.0 and 4.1 percent respectively over the 1971 to 1981 period. The Other occupational group, almost half of which consisted of Clerical workers in 1981, also declined.

An analysis at the more detailed occupational group level, as shown in Table D.7, indicates that the following occupations experienced average annual growth of greater than 20 percent per year over the 1971 to 1981 period: production management, sales and advertising management, architectural and engineering technologists and technicians and electrical and related equipment installers and repairmen. The categories of crushing and grinding, and other product fabricating, assembling and repairing occupations showed average annual declines over the 1971 to 1981 period in the plastics industry in Ontario.

The analysis by sex in Table D.8 indicates female employment increased from 39.1 percent to 40.7 percent of total employment in the Plastic Processing Industry from 1971 to 1981. The greatest increase in female jobs occurred in Product Fabricating, Assembling and Repairing and Materials Handling and Related occupations. At the detailed occupational level, the greatest increases occurred in the fabricating, assembling and repairing and the packaging occupations.

PART III - FUTURE TRENDS: THE SURVEY RESULTS

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Plastic Processing Industry and the factors driving the need and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

As a process industry, plastics production and moulding are highly compatible with advanced manufacturing technologies. These include flexible manufacturing, such as computerized numerically controlled machines, computerized in-process control, and robotics; manufacturing planning and control systems, such as for order entry and inventory control; and computerized design such as computer-aided drafting and design (CAD) which is particularly important in mould making.

Table 2 summarizes the percentage of firms who adopted new technologies before 1985 and their plans for using these technologies in the next five years and after 1990. The following provides observations on the survey findings.

In General

- Firms with over 100 employees have generally been more aggressive than small firms in implementing new technologies to date.

- Firms with fewer than 100 employees see more technologies being adopted during the 1985 to 1990 period, as they will be adopting those already in use by firms with more than 100 employees as well as adopting some of the newer technologies that will be introduced by the larger firms over the next five years.

Results of Question 3

TABLE 2: PLASTIC PROCESSING

Percent of Firms Planning to Adopt New Technologies by Employment Size (1)

Technologies	Before 1985			1985-1990			1990-1995		
	Small	Medium	Total	Small	Medium	Total	Small	Medium	Total
1. DESIGN TECHNOLOGIES									
Computer-Aided Design (CAD)	0	14	7	67	43	55	-	-	-
Computer-Aided Engineering (CAE)	0	14	7	33	29	31	33	29	31
CAD/CAM Integration	0	0	0	33	33	33	-	17	8
Other	0	0	0	-	-	-	-	-	-
2. MANUFACTURING PLANNING AND CONTROL TECHNOLOGIES									
Computerized Financial Systems	75	100	87	25	-	13	-	-	-
Computerized Order Entry/Inventory Control	50	75	62	50	25	38	-	-	-
Computer-Aided Process Planning	25	75	49	50	-	27	-	13	6
Manufacturing Resource Planning Systems (MRP)	33	57	46	33	43	38	33	-	16
Automated Shop Floor Data Collection	0	13	6	50	88	68	50	-	27
Computerized Decision Support Systems	0	25	14	67	63	64	-	13	7
Computerized Maintenance Planning and Control	0	14	6	50	71	59	25	-	14
Other	0	0	0	-	17	10	-	-	-
3. MANUFACTURING PROCESS TECHNOLOGIES									
Computerized Process Control Systems	50	50	50	50	50	50	-	-	-
Computer-Aided Inspection and Testing	67	0	31	33	75	56	-	-	-
Robotic Applications	50	25	38	75	38	57	-	25	12
Flexible Manufacturing Technologies	0	0	0	67	50	59	-	17	8
Computer Integrated Manufacturing (CIM)	0	0	0	-	20	11	-	20	11
Other	0	0	0	-	-	-	-	-	-
4. MATERIALS HANDLING TECHNOLOGIES									
Automatic Bulk Handlers/Feeder Systems	33	75	56	33	13	22	-	-	-
Automated Conveyor/Vehicle Systems	67	33	51	33	50	41	-	-	-
Automated Storage and Retrieval	0	0	0	-	33	19	-	17	10
Computer Controlled Conveyor/Vehicles	0	0	0	-	17	10	-	50	29
Automated Warehouse	0	0	0	-	17	10	-	33	19
Other	0	0	0	-	17	10	-	-	-
5. TELECOMMUNICATIONS TECHNOLOGIES									
Facsimile (FAX) Link: HO/Plant(s)	33	50	42	33	25	29	-	13	7
Computer Link: HO/Plant(s)	33	43	38	33	29	31	-	14	7
Computer Link: Suppliers/Customers	33	25	29	33	50	42	-	13	7
Other	0	0	0	-	-	-	-	-	-
6. OTHER TECHNOLOGIES	0	0	0	-	-	-	-	-	-

(1) '0' used prior to 1985 to indicate have not adopted.
'-' used for periods 1985-1990 and 1990-1995 to indicate respondents, at the time of the survey, are not planning to adopt this technology or 'don't know'.
Responses are not mutually exclusive.

3.1.1 Design Technologies

- Only 14 percent of medium sized firms are currently using computer-aided design (CAD) or computer-aided engineering (CAE) but, by 1990, about 55 percent of all firms in the industry will be using CAD and 31 percent will be using CAE.

- By 1990, 33 percent of firms will have some form of CAD/CAM integration.

3.1.2 Manufacturing Planning and Control Technologies

- 87 percent of firms already have computerized financial systems; the remainder expect to, by 1990.

- 62 percent of firms have computerized order entry/inventory control; the remainder expect to by 1990.

- 49 percent of firms have computer-aided process planning; another 27 percent expect to by 1990.

- 46 percent of firms have manufacturing resource planning (MRP) systems; by 1990 another 38 percent expect to and an additional 16 percent plan to have them in place by 1995.

- By 1990, 64 percent expect to be using computerized decision support systems.

- 68 percent expect to have automated shop floor data collection by 1990, and another 27 percent will have them in place by 1995.

- Computerized maintenance planning and control is used by only 6 percent of the industry, but 59 percent expect to adopt them in the next five years and 14 percent, by 1995.

3.1.3 Manufacturing Process Technologies

- Half of the firms surveyed already use some form of computerized process control systems and the remainder expect to by 1990.

- 38 percent report the use of robotics already; 57 percent expect to adopt robotics by 1990.

- 59 percent expect to be adopting flexible manufacturing systems before 1990, whereas none are currently in place.

3.1.4 Materials Handling Technologies

- More than 50 percent of firms already use some form of automatic feeder or conveyor systems and an additional 22 to 41 percent plan adoption in the next five years.

- Computer-controlled vehicles and warehouses will begin to appear in this industry in the next five years. Only medium sized firms (17%) expect to adopt them before 1990, and another 50 percent of medium sized firms will adopt these technologies in the period 1990 to 1995.

3.1.5 Telecommunications Technologies

- 42 percent of firms already have a FAX or computer link between head office and their plant(s) and another 29 percent expect to by 1990.

- 29 percent of firms already have a computer link with suppliers/customers and 42 percent plan adoption in the next five years.

3.2 Forces Driving the Need to Adopt New Technology

A few key forces are driving these firms to adopt new technologies. Table 3 summarizes the responses to a series of open-ended questions. The most important factors (ranked according to the weighted importance shown in the table) are:

- To remain competitive. This was the dominant factor for small firms where 75 percent ranked this as the most important driving force,
- To increase quality,
- To enter new markets,
- Strategic reasons,
- To increase productivity, and
- To increase skills or organizational capability.

The selection and ranking of reasons for adopting new technologies reflected an industry that is actively using them as a vehicle for growth. These firms are not focussing on such defensive concerns as reducing costs, and do not appear to be willing to let current equipment become obsolete.

3.3 Factors That Could Slow the Rate of Technology Adoption

A few factors could slow the rate at which plastics firms adopt new technologies. Table 4 summarizes the results of the survey. The most important factors are:

- Poor economic conditions. This was mentioned first by 33 percent of the medium sized firms and mentioned second by 50 percent of the small firms.

Results of Question 4

TABLE 3: PLASTIC PROCESSING SIC 165

Most Important Factors Driving Need to Adopt New Technologies

Factor		Percent of Firms by Employment Size: Small (20-99)	Medium (100-499)	Total Firms
COMPETITIVE PRESSURES	First	75	22	49
	Second	0	0	0
	Third	0	0	0
	Weighted Importance (1)	2.3	0.7	1.5
STRATEGIC	First	25	11	18
	Second	0	11	6
	Third	0	0	0
	Weighted Importance	0.8	0.6	0.7
INCREASE QUALITY	First	0	11	6
	Second	25	22	24
	Third	25	22	24
	Weighted Importance	0.8	1.0	0.9
CUSTOMER DEMANDS FOR CHANGES	First	0	11	6
	Second	0	11	6
	Third	0	11	6
	Weighted Importance	0.0	0.7	0.3
INCREASE PROFITABILITY	First	0	11	6
	Second	0	0	0
	Third	0	11	6
	Weighted Importance	0.0	0.4	0.2
INCREASE PRODUCTIVITY	First	0	11	6
	Second	25	0	13
	Third	0	33	17
	Weighted Importance	0.5	0.7	0.6
INCREASE MANAGEMENT INFORMATION	First	0	0	0
	Second	0	22	11
	Third	0	0	0
	Weighted Importance	0.0	0.4	0.2
LOWER COSTS	First	0	0	0
	Second	0	11	6
	Third	0	0	0
	Weighted Importance	0.0	0.2	0.1
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	0	11	6
	Second	25	22	24
	Third	0	0	0
	Weighted Importance	0.5	0.8	0.6
ENTER NEW MARKETS/ GROWTH	First	0	11	6
	Second	0	0	0
	Third	75	22	49
	Weighted Importance	0.8	0.6	0.7
ALL OTHERS	First	0	0	0
	Second	25	0	13
	Third	0	0	0
	Weighted Importance	0.5	0.0	0.3

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 5

TABLE 4: PLASTIC PROCESSING — SIC 165

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size: Small (20-99)	Medium (100-499)	Total Firms
ABILITY TO FINANCE	First	0	22	11
	Second	25	22	24
	Third	0	0	0
	Weighted Importance (1)	0.5	1.1	0.8
COST OF NEW TECHNOLOGY	First	50	11	31
	Second	0	22	11
	Third	0	0	0
	Weighted Importance	1.5	0.8	1.1
COMPETITIVE ENVIRONMENT	First	0	0	0
	Second	0	11	6
	Third	0	0	0
	Weighted Importance	0.0	0.2	0.1
POOR ECONOMIC CONDITIONS	First	0	33	17
	Second	50	11	31
	Third	0	11	6
	Weighted Importance	1.0	1.3	1.2
EMPLOYEE ACCEPTANCE	First	0	0	0
	Second	25	0	13
	Third	0	0	0
	Weighted Importance	0.5	0.0	0.3
LACK OF SKILLS AND/OR KNOW-HOW TO IMPLEMENT	First	0	11	6
	Second	0	0	0
	Third	50	11	31
	Weighted Importance	0.5	0.4	0.5
LACK OF NEW TECHNOLOGY STANDARDIZATION	First	25	11	18
	Second	0	11	6
	Third	0	22	11
	Weighted Importance	0.8	0.8	0.8
UNWILLINGNESS TO CHANGE	First	25	0	13
	Second	0	0	0
	Third	0	0	0
	Weighted Importance	0.8	0.0	0.4
ALL OTHERS	First	0	11	6
	Second	0	11	6
	Third	0	0	0
	Weighted Importance	0.0	0.6	0.3

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

- The cost of new technology. This was mentioned as most important by 50 percent of the small firms, and only 11 percent of medium sized firms.

- Lack of standardization of new technologies and the ability to finance the purchase of new technology was a concern mainly of the medium sized firms.

- Lack of skills or know how in implementation was ranked third most important by small firms.

- Unwillingness to change was cited by 25 percent of the small firms and by none of the medium sized firms.

It is notable that unwillingness to change and employee resistance were mentioned by 25 percent of the small firms, but not mentioned at all by the larger firms. Union resistance was not mentioned by any respondents.

In summary, the Plastic Processing Industry will be an extensive user of design technologies and manufacturing planning technologies. Medium sized firms are already well launched on processing implementation and small firms will make major new commitments by 1990. The main reasons for adopting technologies are to remain competitive, to increase quality and to enter new markets. The main inhibitors are poor economic conditions and the cost of new technologies.

4.0 INDUSTRY OUTLOOK TO 1995

This chapter describes the respondents' view of the outlook for the industry in terms of aggregate output (i.e., manufacturing shipments in Ontario), investment plans, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

Following a 7.8 percent average annual growth rate from 1971 to 1981, the value of shipments (in constant dollars) declined by 5.4 percent from 1981 to 1982 to $654 million. The firms surveyed estimated growth of 3 percent in 1983, 6.5 percent in 1984, and 4.5 percent in 1985. They then projected growth of 6.5 percent per annum from 1985 to 1990 and of 5.5 percent from 1990 to 1995 (see Table 5). Firms with over 100 employees experienced stronger growth than the small firms from 1982 to 1984 and they were more optimistic about the 1990's than were the smaller firms.

Experts in the field have a somewhat more buoyant view forecasting 8 to 10 percent per annum growth in output from 1985 to 1990, and 5 to 7 percent from 1990 to 1995.

4.2 Investment Patterns

Capital investment in the Ontario industry is estimated, by experts in the field, to be largely concentrated in machinery and equipment during the next ten years.

The survey results suggest that approximately 70 percent of total capital spending will be in machinery and equipment from 1985 to

Results of Question 1

TABLE 5: PLASTIC PROCESSING — SIC 165

Manufacturing Shipments in Ontario

(1)

Firms by Employment Size	Average Annual Compound Rate of Change (in Constant Dollars)				
	Estimated			Expected	
	1982-1983	1983-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	0.5	4.5	4.0	6.0	5.0
Medium (100-499)	6.0	8.5	5.5	6.5	6.5
Total Firms	3.0	6.5	4.5	6.5	5.5

(1) Rounded to closest 0.5%.

1990, rising to 90 percent after 1990. While little construction investment is expected to be related to new technology, more than half of the machinery and equipment investment is expected to be related to it.

4.2.1 Justifying Financial Investment in New Technology

When considering investments in new technology, 75 percent of the firms surveyed indicate that they use the concept of pay-back period in assessing such a decision (Table 6). On average, firms expect a pay-back within 3 years. About 37 percent of the firms use return on investment (ROI) to evaluate investment decisions and have comparable pay-back expectations. (Some firms use both methods.) On average they expect a 23 to 30 percent ROI.

4.2.2 Source of New Capital Spending

Small firms in the plastics industry expect to finance only about 45 percent of their capital programs from internal funds (Table 7). However, medium sized firms expect internal sources of funds to meet 83 percent of their financing requirements.

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate employment.

Results of Question 17e

TABLE 6: PLASTIC/PROCESSING — SIC 165

Justifying Financial Investment in New Technology

Firms by Employment Size	Pay-Back Period: % of Firms Using Pay-Back	Pay-Back Period: Average Period	Return on Investment: % of Firms Using ROI	Return on Investment: Average Rate
Small (20-99)	75	3	25	30
Medium (100-499)	75	3	50	23
Total Firms	75	3	37	26

Answers not mutually exclusive.

Results of Question 17f

TABLE 7: PLASTIC/PROCESSING — SIC 165

Source of Funds for New Technology Spending

Firms by Employment Size	Internal Funds	External Funds
	Percent	Percent
Small (20-99)	45	55
Medium (100-499)	83	17
Total Firms	60	40

4.3.1 Factors Affecting Employment

When asked to identify the most important factors affecting the firm's employment level in Ontario, respondents identified the following, ranked according to weighted importance. See Table 8.

- ability to compete (38 percent mentioned this first. and is of prime importance to the small firms),
- product diversification (selected by both small and medium sized firms),
- profitability,
- introduction of new technology,
- increase sales,
- exchange rate and industry-wide growth.

4.3.2 Employment Outlook

From 1971 to 1981, employment in plastics fabricating grew at an annual rate of 4.2 percent. During 1982 employment dropped by 4.4 percent to 19,218. The survey findings suggest that these job losses were overcome during 1983 as the respondents estimated employment grew by 9 percent from 1981 to 1984 and that it would jump by 7 percent in 1985 (Table 9). In terms of the future, they saw employment growth slowing to 3 percent per annum from 1985 to 1990 and 1 percent per annum from 1990 to 1995. The smaller firms generally expected more rapid job creation than firms with over 100 employees. The larger firms actually expect a slight decline from 1990 to 1995.

Experts in the field were not so optimistic for the period 1985 to 1990, but they agreed with the projection for 1990 to 1995.

Results of Question 11a,b,c

TABLE 8: PLASTIC PROCESSING — SIC 165

Most Important Factors Affecting The Firms' Employment in Ontario

Factor		Percent of Firms by Employment Size: Small (20-99)	Medium (100-499)	Total Firms
PROFITABILITY/ FINANCIAL STRENGTH	First	25	13	19
	Second	0	0	0
	Third	0	25	12
	Weighted Importance (1)	0.8	0.6	0.7
INCREASE SALES/ INCREASE MARKET SHARE	First	0	38	18
	Second	0	0	0
	Third	0	0	0
	Weighted Importance	0.0	1.1	0.5
INTRODUCTION OF NEW TECHNOLOGY	First	0	0	0
	Second	25	50	37
	Third	0	0	0
	Weighted Importance	0.5	1.0	0.7
SUCCESS IN FOREIGN MARKETS	First	0	0	0
	Second	0	13	6
	Third	25	0	13
	Weighted Importance	0.3	0.3	0.3
PRODUCT DIVERSIFICATION	First	25	0	13
	Second	25	38	31
	Third	0	25	12
	Weighted Importance	1.3	1.0	1.1
ABILITY TO COMPETE	First	50	25	38
	Second	0	0	0
	Third	0	0	0
	Weighted Importance	1.5	0.8	1.2
INDUSTRY-WIDE GROWTH	First	0	13	6
	Second	25	0	13
	Third	0	0	0
	Weighted Importance	0.5	0.4	0.4
OVERALL ECONOMIC GROWTH	First	0	0	0
	Second	0	0	0
	Third	0	13	6
	Weighted Importance	0.0	0.1	0.1
FOREIGN EXCHANGE RATE/CANADIAN COMPETITIVENESS	First	0	13	6
	Second	25	0	13
	Third	0	0	0
	Weighted Importance	0.5	0.4	0.4

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

4.3.3 Trends in Part-Time Work

Part-time employment is becoming somewhat more important to the industry. In 1981 and 1984 only 1 to 2 percent of total employment was estimated to be part-time. In 1985, firms anticipate an increase to 4.5 percent. By 1990 and through to 1995, an estimated 5.5 percent of total employees are expected to be part-time.

4.4 Changes in Occupational Structure

Table 10 shows trends in occupational structure (i.e., percent of total industry employment by occupation) in the Plastic Processing Industry from 1981 to 1995.

In terms of employment totals, the number of jobs in all major occupational categories is expected to increase. The relative rates of growth will differ, with the result that the survey shows shifts in the proportion of the Ontario industry's work force in the following occupational groups (Table 10).

- a decline in the proportion of Managerial, Administrative and Related occupations from 1985 to 1990 followed by an increase after 1990;

- a significant increase in Natural Sciences, Engineering and Mathematics occupations, notably in the engineering technicians and technologists category;

- significant declines in Processing and in Fabricating, Assembly and Repair;

- within the broad category of Fabricating, Assembly and Repair, increases in supervisors were noted, with a decline in plastics fabricating occupations;

Results of Question 11d

TABLE 9: PLASTIC PROCESSING — SIC 165

Firms' Employment Trends in Ontario

Firms by Employment Size	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated		Expected	
	Rate		Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	12.5	10.5	6.0	3.5
Medium (100-499)	7.5	5.5	1.0	-0.5
Total Firms	9.0	7.5	3.0	1.0

(1) Rounded to closest 0.5%.

- a slight increase in Materials Handling and Related occupations; and

- a slight increase in Machining occupations is expected; however, of the specific categories, only machinist and machine tool setting-up will increase. The importance of tool and die makers and mould makers will decline.

Results of Question 12

TABLE 10: PLASTIC PROCESSING — SIC 165

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	13.2	12.6	12.3	11.7	12.4
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	5.9	6.1	6.3	9.7	10.9
• Engineers		-	-	+	+
• Engineering Technicians and Technologists		+	+	+	+
• Systems Analysts and Computer Programmers		+	+	+	+
• All Other Science and Mathematics (not listed above)		o	o	o	o
PROCESSING	24.3	19.1	18.7	17.8	18.1
MACHINING	9.1	11.0	11.5	12.4	11.8
• Tool and Die Making and Mould Makers		-	-	-	-
• Machinist and Machine Tool Setting-Up		+	+	+	+
• All Other Machining (not listed above)		-	-	-	-
FABRICATING, ASSEMBLING AND REPAIRING	31.6	33.5	33.7	30.0	28.6
• Supervisors: Plastics		+	+	+	+
• Moulding: Plastics		o	o	o	o
• Fabricating: Plastics		-	-	-	-
• All Other Fabricating, Assembling and Repairing (not listed above)		+	+	+	+
MATERIALS HANDLING AND RELATED	4.7	4.8	4.8	5.4	5.3
ALL OTHER OCCUPATIONS	11.2	12.9	12.6	13.0	12.8
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease o no change

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results on the employment effects of new technology in terms of skills match and requirements, and impact on skill levels and job content.

5.1 Effects on Occupations

Table 11 summarizes firms' expectations of technology impacts on occupational requirements. There is consensus that many occupations will be in short supply within their organizations, namely:

- Natural Sciences, Engineering and Related occupations, where 53 percent of the firms expect shortages of engineers, 58 percent shortages of engineering technicians and technologists, and 40 percent expect shortages of systems analysts and programmers.

- Processing occupations, with 38 percent anticipating shortages.

- Machining occupations: 60 percent of the firms expect to have a need for machinists and machine tool set up while 58 percent expect a shortage of tool and die makers and mould makers;

- Supervisors of Fabricating and Assembly, anticipated to be in short supply by 53 percent; and

- Managerial and Administrative positions, by 35 percent.

The only occupations where an oversupply may occur due to technology adoption are:

- Managers (22%), where opinion appears to be divided;

Results of Question 6

TABLE 11: PLASTIC PROCESSING

SIC 165

Impact of Technology on Selected Occupations in Firms 1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	22	35	43
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	6	53	42
• Engineering Technicians and Technologists	6	58	36
• Systems Analysts and Computer Programmers	0	40	60
PROCESSING	6	38	56
MACHINING			
• Tool and Die Making and Mould Makers	0	58	42
• Machinist and Machine Tool Setting-Up	6	60	33
FABRICATING, ASSEMBLING AND REPAIRING			
• Supervisors: Plastics	11	53	36
• Moulding: Plastics	42	24	35
• Fabricating: Plastics	29	18	53
MATERIALS HANDLING AND RELATED	40	0	60
OTHER	6	6	89

- Fabricating occupations such as moulders and fabricators (42 and 29 percent respectively). However, between 18 percent and 24 percent of the reporting firms expected shortages in these two occupations.

- Material Handlers (40 percent expected an oversupply).

This is consistent with the expectation noted in Chapter 4, that employment in these two major occupational groups will be growing more slowly than in other groups.

5.2 Likely Steps to Deal With Skills Oversupply

In dealing with a potential oversupply of skills in their organizations, the most commonly cited step which would affect the largest number of people was attrition, although retraining was mentioned as a possibility for Fabricating occupations and Materials Handling. Layoffs were mentioned with respect to excess Managerial and Administrative staff and also Fabricating occupations (see Table 12).

5.3 Likely Steps to Cope With Skills Shortages

In responding to the question of anticipated shortage of required skills, firms generally replied in greater detail than to that of oversupply (see Table 12). This is consistent with their expectations as outlined in Section 5.1 and Table 11.

Recruiting of employees was the most commonly cited step to deal with occupations where education is required, that is, in the Natural Sciences, Engineering and Mathematics category. It was also cited as most important for tool and die making and mould makers.

For the Fabricating, Assembling and Repairing occupations, retraining was selected as the most important step to cope with skill shortages.

Results of Question 7

TABLE 12: PLASTIC PROCESSING SIC 165

Steps Firms Will Likely Take to Deal With OVERSUPPLY of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Attrition	Layoffs	Transfer, Early Retirement, Downgrade
PROCESSING	Upgrade	Retain	(1)
FABRICATING, ASSEMBLING AND REPAIRING			
• Moulding: Plastics	Attrition	Retrain	Layoffs
• Fabricating: Plastics	Retrain	Attrition	Layoffs
MATERIALS HANDLING AND RELATED	Attrition	Retrain	Other

(1) Only two steps mentioned.

Results of Question 8

TABLE 13: PLASTIC PROCESSING — SIC 165

Steps Firms Will Likely Take to Deal With SHORTAGE of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Upgrade	Retrain	Recruit
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	Recruit	Upgrade	(1)
• Engineering Technicians and Technologists	Recruit	Retrain	Upgrade
• Systems Analysts and Computer Programmers	Recruit	Retrain	Upgrade
PROCESSING	Retrain	Recruit	Upgrade
MACHINING			
• Tool and Die Making and Mould Makers	Recruit	Retrain	Upgrade
• Machinist and Machine Tool Setting-Up	Retrain	Recruit	Upgrade
FABRICATING, ASSEMBLING AND REPAIRING			
• Supervisors: Plastics	Retrain	Upgrade	Recruit
• Moulding: Plastics	Retrain	Recruit	(1)
• Fabricating: Plastics	Retrain	Upgrade	(1)

(1) Only two steps mentioned.

For Managerial and Administrative occupations, upgrading was most commonly cited as important.

There were a mixture of responses forthcoming as to the second most common step to deal with shortages, but retraining was cited for four occupations, recruitment for three, and upgrading for three.

Upgrading was the third most commonly cited step, mentioned for five occupations including the Machining and the Natural Sciences, Engineering and Mathematics occupations.

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to rank the impact of new technologies on selected occupations in terms of:

- skills required,
- time to achieve proficiency, and
- knowledge of firm's operations.

The results are summarized in Table 14. Respondents expected the skill levels required to rise across all occupations. This trend was most pronounced for Managerial, Engineering and Processing occupations. There was less unanimity about whether more time would be required to achieve proficiency and whether greater knowledge of the firm's operations would be needed. The skill levels and job content of managers, professional/technical occupations and processing occupations are expected to be more affected than machining occupations.

5.5 Training Costs and New Technology

Plastics firms estimate that they currently spend between 3 percent (in 1984) and 5 percent (in 1985) of their total labour costs on training. This will average about 6 percent in the 1990's. Between 40 percent and 45 percent of the training costs currently are related to new technology, compared to an

estimated 25 percent in 1981. By 1990, more than half of all training costs will be related to new technology. Small firms now attribute less than medium sized firms to technology (41 percent versus 51 percent) but they expect technology to generate even more training costs by 1995 than do medium sized firms. (60 percent versus 51 percent).

TABLE 14: PLASTIC PROCESSING — SIC 165

Results of Question 9

Impact of Technology on Skill Levels and Job Content

Occupations	Skills Required (1) Percent of Firms			Time to Achieve Proficiency (1) Percent of Firms			Knowledge of Firm's Operations (1) Percent of Firms		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	94	0	6	48	21	32	65	0	35
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Engineers	94	0	6	51	15	34	62	6	32
• Engineering Technicians and Technologists	100	0	0	68	0	32	71	7	22
• Systems Analysts and Computer Programmers	84	8	8	52	8	40	76	0	24
PROCESSING	100	0	0	67	26	8	57	0	43
MACHINING									
• Tool and Die Making and Mould Makers	67	8	26	50	10	41	33	0	67
• Machinist and Machine Tool Setting-Up	62	7	31	38	24	38	46	0	55
FABRICATING, ASSEMBLING AND REPAIRING									
• Supervisors: Plastics	87	0	13	49	22	29	43	0	57
• Moulding: Plastics	79	0	21	64	0	36	29	0	71
• Fabricating: Plastics	69	0	31	28	0	72	28	0	72
MATERIALS HANDLING AND RELATED	42	0	58	72	14	14	32	0	68
OTHER	100	0	0	0	0	100	100	0	0

+ increase - decrease 0 remain the same

(1) Non-responses excluded.

6.0 LABOUR RELATIONS ENVIRONMENT

This chapter discusses the labour relations environment in the industry.

6.1 Industrial Relations Environment: Historical

Approximately 28 percent of the total work force in plastics (19,218 in 1982) was unionized. Approximately 1 out of 3 firms has a union. Twenty different unions represent employees in the industry. See Table 15. Major unions in the industry are:

	Share of Unionized Workers in Plastics Fabricating
Rubber Workers	20%
United Auto Workers	15%
Clothing and Textile Workers	13%

The major employers with union agreements are listed in Table 16.

Only two out of the four union agreements representing more than 200 employees (the minimum level for the Ontario Ministry of Labour's data base) had technology clauses in their settlements. The clauses included:

- advance notice of technological innovations;
- training programs for those employees displaced by new technology;
- income protection for those employees transferred to a new position as a result of technological innovation; and

TABLE 15

UNIONS REPRESENTING WORKERS IN PLASTIC PROCESSING

(LISTED IN DECREASING ORDER OF NUMBER OF EMPLOYEES)

Rubber Workers
United Auto Workers
Clothing and Textile Workers
United Steelworkers
United Electrical Workers
Aluminum Brick and Glass
Leather and Plastics Workers
Molders
Canadian Operating Engineers
Machinists
Energy and Chemical Workers
Independent Local
Graphic Communications
Teamsters
Sheet Metal Workers
Novelty Workers
Boilermakers
International Brotherhood of Carpenters and Joiners
Labourers
Plumbers

- transfer arrangements for employees displaced by technological change.

6.2 Trends in Unionization

The survey suggests that firms with over 100 employees are more likely (67 percent) to have a union than smaller firms (50 percent) in 1984. Firms were not asked whether they expect a greater share of firms to become unionized over the next ten years.

For firms with unions, approximately 80 percent of their work force is unionized. Firms anticipate little change in the percentage of unionization within firms which already have a union.

6.3 Technology Change Clauses

Survey respondents for firms of 100 to 499 employees indicated that 40 percent of their union contracts have technology change clauses. None of the small firms reported having any such clause.

Clauses for the medium size firms included:

- Seniority (100%),
- Notice/disclosure and job security (67%), and
- Consultation/participation (33%).

6.4 Management's Perception of their Union's Position on New Technology

Of the firms reporting a union, 80 percent perceive that the union accepts the need to adopt new technology. This is consistent with our findings that firms do not see union resistance as a factor which would slow their rate of new technology adoption. Management sees the impact of technology on union membership as the most significant concern of unions, followed next by job security.

TABLE 16

INDUSTRIAL RELATIONS: PLASTICS FABRICATING INDUSTRY

UNION	NUMBER OF EMPLOYEES	MAJOR EMPLOYER*	LOCATION	TECHNOLOGY CHANGE CLAUSE IN AGREEMENT
RUBBER WORKERS	330	Canadian General-Tower	Cambridge	Advance Notice
	215	Davidson Rubber Co.	Port Hope	None
	175	Reeves Bros. Canada	Toronto	NA
	130	Morval-Durofoam Ltd.	Kitchener and Waterloo	NA
UNITED AUTO WORKERS	320	Sheller-Globe of Canada Steering Wheel Division	Brampton	None
CLOTHING AND TEXTILE WORKERS	300	Woodbridge Foam	Woodbridge	Training, Income Protection, Transfer Arrangements
	142	Donlee Plastics, Division of Donlee Manufacturing Industries	Toronto	NA
	138	Midland Industries, Divsion of Waltec Inc.	Midland	NA
	120	Lear Siegler Industries	Ajax	NA
UNITED ELECTRICAL WORKERS	175	Plasticap Ltd. & Premier Plastics	Richmond Hill	NA
	130	Domtar Inc. Construction Materials, Arborite Division	Vaughan Twp.	NA
ALUMUNIM, BRICK AND GLASS WORKERS	181	Ethyl-Imco Inc.	Mississauga	NA
	160	Portion Packaging, Division of Consumers Glass	Etobicoke	NA
LEATHER AND PLASTIC WORKERS	125	Maple Leaf Plastics	Scarborough	NA
UNITED STEEL WORKERS	180	Rockwell International of Canada	Gananoque	NA
INDEPENDENT LOCAL	150	P.V. Trim	Mississauga	NA
MACHINISTS	150	Protective Plastics	Toronto	NA
CANADIAN OPERATING ENGINEERS	138	Cryovac, Division of W.R. Grace & Co. of Canada	Mississauga	NA
MOLDERS	130	Multi Fittings	London	NA
GRAPHIC COMMUNICATIONS	135	Dow Chemical Canada Inc.	Toronto	NA

* Employer with a union agreement covering 100 employees or more. The union agreements above represent 65 percent of unionized employees.

NA - Information not available on Ontario Ministry of Labour data base.

SOURCE: Collective Bargaining Agreement Systems, Ontario Ministry of Labour.

Of the union leaders interviewed in the sample firms, all readily acknowledge the need to adopt new technology in order to remain competitive. They also acknowledge the need to provide employment protection for existing employees, although the loss of some jobs was favoured over plant closure. The need for retraining was also commonly cited in the union interviews.

6.5 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity/quality, and adopting new technology.

- More than half of the firms surveyed have a mechanism for worker involvement in setting production targets at some level in the organization and involvement was greater in the small firms than in the larger.

- Over 70 percent have a mechanism for worker involvement for improving productivity/quality.

- But only 36 percent have a mechanism for worker involvement for adopting new technology.

In all cases, small firms reported a higher frequency of worker involvement than medium sized firms.

Although the sample of union leaders is not statistically significant, those interviewed perceive a somewhat lower level of consultation than the sample of firms' responses would suggest.

6.6 Views on Involving Workers in Decisions on Adopting New Technology

Management and union leaders were also asked to what extent and how should management involve workers in decisions regarding the adoption of new technologies.

Management was divided in their views on the extent of involvement, however, most firms agreed that some level of worker involvement was desirable. Most suggested limited involvement at the discussion or information level was sufficient but were aware of the need, at a smaller degree, of more direct involvement, in the form of training, as new technology comes on stream.

Union leaders were unanimous in their view that high levels of consultation were advisable and that this would enhance the implementation of new technology.

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

The following chapter reports the results of the survey regarding questions related to planning for technology change. A summary of these results appears in Table 17.

In general, firms with 100 or more employees are more likely to have plans and longer planning horizon times than do the smaller firms. For example, only 25 percent of the small firms reported having a long term strategic plan, while 63 percent of the medium sized firms have such a plan.

Both the human resource and capital investment plans appear to be well established with over 60 percent of the industry having plans which meet future needs out to 1987, on average. This matches their expected pay-back period for new machinery and equipment.

The integration level appears to be higher for medium sized firms, but, generally, human resource needs and capital plans are not well integrated.

Results of Question 18

TABLE 17: PLASTIC PROCESSING

SIC 165

Planning for Technological Change

Firms by Employment Size	Strategic Plan	Human Resource Plan		Capital Investment Plan		Perceived Integration Between Capital and Human Plans (1)
	Percent of Firms With Plan	Percent of Firms With Plan	Length of Planning Horizon	Percent of Firms With Plan	Length of Planning Horizon	
Small (20-99)	25	50	3 years	75	3 years	2.3
Medium (100-499)	63	75	4 years	43	5 years	2.7
Total Firms	43	62	3 years	61	4 years	2.5

1. Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

PART IV - APPENDICES

Part IV of this report presents the appendices referred to in Parts I to III.

These appendices are:

Appendix	Title	Reference
A	Firm Employment Size Categories Used in the Survey of the Plastic Processing Industry	Part I
B	Questionnaire and Responses by Question	Part I Part III
C	Reliability of the Sample	Part I
D	Historical Tables	Part II

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE PLASTIC PROCESSING INDUSTRY

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE PLASTIC PROCESSING INDUSTRY

Size Categories Used to Stratify the Sample Frame	Size Categories Used to Weight and Report Survey Results	
Number of Employees		Number of Employees
20 - 49	Small	20 - 99
50 - 99		
100 - 199	Medium	100 - 499
200 - 499		
500 - 999	Large	500 or more
1000 - 1499		
1500 - 2499		
2500 - 4999		
5000 or more		

APPENDIX B

QUESTIONNAIRE

AND

RESPONSES BY QUESTION

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

PLASTICS PROCESSING
(SIC 165)
QUESTIONNAIRE

Currie, Coopers & Lybrand
Management Consultants

INTRODUCTION

Thank you for agreeing to participate in the study. It is being carried out for the Ontario Task Force on Employment and New Technology, a joint labour-management group. Their mandate is to examine the extent and nature of employment change likely to result from the introduction and application of new technology in Ontario over the next ten years.

You Will Receive The Survey Results
As a participant, you will receive a report on the survey results for your industry.

All Responses Will Be Confidential
All responses will be held in strictest confidence. Responses will be analysed and used only at an industry-wide level.

Both Organized Labour and Management Are Being Surveyed
Management and organized labour participants, in the case of unionized firms, will both receive a questionnaire. We realize that labour participants may not be able to answer some of the questions. In particular, they may find difficulty in answering questions: 10, 11, 12, 13 and 17.

Participants May Want to Consult Key Resource People in Responding
The questionnaire is not necessarily meant to be completed by only one respondent. It may be appropriate and even desirable for survey participants to consult other key resource people in their firm before responding to the questionnaire. Respondents should indicate on the Participant Information (p.4), the "principle respondent" and "other respondents" as well as the Section(s) of the questionnaire to which they contributed.

You Will Save Time if Information is Filled in Before the Interview
A number of questions relate to your firm's past or present workforce and future plans. We are requesting management respondents to provide accurate information from their organization's records in advance of the interview. This step will reduce the time needed for the actual interview and also make it more meaningful. The Participant Information (p.4) and the following questions should be filled in prior to the management interview: 3, 6 to 13 inclusive, 15 and 17.

Group Interviews Are Possible
In some cases the principle respondent may want to arrange a group interview between himself, key resource people and our consultant. We would welcome such an arrangement. This option is open to either management or labour participants.

You May Wish to Complete the Entire Questionnaire Before the Interview
The entire questionnaire could be completed in advance of the interview. If this is convenient, please do so. We would, however, still wish to spend a half-hour with you to review your responses.

Your "Best" Estimate
Where estimates are required, we are asking respondents to provide us with their "best estimate". Estimating future trends is difficult. Our premise is that an expert inside the organization is in the best position to make them, based on his or her knowledge of the firm's future direction.

(SIC 165)

EXHIBIT A

SELECTED OCCUPATIONS: PLASTICS PROCESSING, SIC 165

MANAGERIAL, ADMINISTRATIVE & RELATED (includes senior and middle management and administrative support functions such as personnel officers, financial officers).

NATURAL SCIENCE, ENGINEERING & MATHEMATICS

Engineers.
Engineering Technicians & Technologists.
Systems Analysts & Computer Programmers.

PROCESSING (includes materials processing occupations such as: mixing, blending, grinding straining, spreading, compounding, sampling, testing, inspecting).

MACHINING

Tool & Die Making & Mold Makers.
Machinist & Machine Tool Setting-Up

FABRICATING & ASSEMBLING & REPAIRING

Supervisors: Plastics Fabricating
Moulding: Plastics.
Fabricating: Plastics.

MATERIAL HANDLING & RELATED (includes such occupations as hoisting, material handling equipment operators and packaging).

The Study is Focusing on Selected Occupations

The Task Force for your industry is focusing on chosen major occupational groups and selected occupations within these major groups. These are listed in Exhibit A. The job titles and definitions being used are from the "Canadian Classification and Dictionary of Occupations, 1971" (CCDO). The CCDO is a universal system of job titles and descriptions. Our consultants are available to assist you or your staff in clarifying which of your firm's positions should be considered in the CCDO titles listed in Exhibit A.

Please Call If You Have Any Enquiries

Should you or your staff require any assistance, please call Sandra Skivsky of our firm or the consultant who will be interviewing you, at 366-1921.

Your Participation Is Appreciated

While we appreciate that your participation in the survey puts a demand on your time and organization, we would emphasize that your contribution will have an important impact on the results of this project.

(SIC 165)

PARTICIPANT INFORMATION

COMPANY NAME: _____

UNION NAME (If appropriate): _____

AFFILIATED ORGANIZATIONS: _____

MAIN ADDRESS: _____

TELEPHONE NUMBER: ( ) _____

BRIEF DESCRIPTION OF OPERATION IN ONTARIO

Divisions/Branches/Affiliates	Products/Services
_____	_____
_____	_____
_____	_____
_____	_____

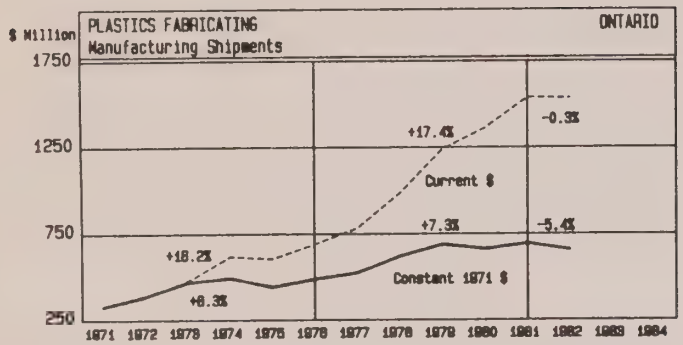
SURVEY PARTICIPANTS

Names	Position	Number of Years With Company	Number of Years With Industry	Check (✓) Sections Answered II	III	IV	V	VI	VII
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
(principal respondent)									
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
(other respondents)									
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐

(SIC 165)

CHART 1

INDUSTRY-WIDE MANUFACTURING SHIPMENTS IN ONTARIO*



* Source: Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. Graph, constant dollar calculation and rates of change by Economics Practice, Currie, Coopers & Lybrand.

(SIC 165)

1. INDUSTRY-WIDE MANUFACTURING SHIPMENTS IN ONTARIO

Chart 1, opposite, illustrates manufacturing shipments for the Plastics Processing Industry in ONTARIO in current dollars (dotted line) and in constant dollars (current dollars adjusted for price changes-solid line).

The rates shown for the first three time periods listed below are expressed in annual compound rates of change (in constant dollars).

Using these rates as a guide, please estimate the annual compound rates of change (in constant dollars) of your industry's value of manufacturing shipments in Ontario for the next five periods listed.

Manufacturing Shipments in Ontario	Annual Compound Rate of Change (in constant dollars)
1971 to 1976	+8.3 %
1976 to 1981	+7.3 %
1981 to 1982	-5.4 %
	Your Estimates (Indicate if + or -)
1982 to 1983?	____ %
1983 to 1984?	____ %
1984 to 1985?	____ %
1985 to 1990?	____ %
1991 to 1995?	____ %

(SIC 165)

2. INDUSTRY-WIDE OUTLOOK - EMPLOYMENT IN ONTARIO

The table below indicates total employment and annual compound rates of change for employment in the Plastics Processing Industry in ONTARIO between 1971 and 1982. (Statistics Canada, Cat. No. 31-203).

Would you please indicate your estimates for the five following periods listed below (i.e., 1983-1995). Provide your estimates in actual numbers or in annual compound rates of change, whichever is easier.

For your information, total employment covers full-time, part-time, temporary, casual and contract - i.e., total "head count".

Total Employment in Ontario		Annual Compound Rates of Change	
1971	13,360		
1981	20,107	1971-1981	+4.2 %
1982	19,218	1981-1982	-4.4 %

Your Estimates:

				(Indicate if + or -)
1983?	_____	OR	1982-1983?	____ %
1984?	_____	OR	1983-1984?	____ %
1985?	_____	OR	1984-1985?	____ %
1990?	_____	OR	1985-1990?	____ %
1995?	_____	OR	1990-1995?	____ %

(SIC 165)

3. FIRM'S ADOPTION OF TECHNOLOGIES

The following questions refer to new technologies your firm has already or may adopt over the next ten years in ONTARIO.

3a. Please indicate the technologies that have already been adopted by your firm. Record your answer on Chart 3, opposite, under column 3a.

3b. Please indicate the technologies that will probably be adopted by your firm between 1985 and 1990. Record your answer on Chart 3, under column 3b. It may be appropriate to check more than one time period.

3c. Please indicate the technologies that will probably be adopted by your firm between 1991 and 1995. Record your answer on Chart 3, under column 3c. It may be appropriate to check more than one time period.

CHART 3

TECHNOLOGIES ADOPTED OR TO BE ADOPTED BY THE FIRM

	3a ADOPTED IN 1984 OR BEFORE	3b WILL BE ADOPTED BETWEEN 1985-1990?	3c WILL BE ADOPTED BETWEEN 1991-1995?
1. DESIGN TECHNOLOGIES	☐	☐	☐
Computer-Aided Design (CAD)	☐	☐	☐
Computer-Aided Engineering (CAE)	☐	☐	☐
CAD/CAM Integration	☐	☐	☐
Any Others? _____	☐	☐	☐
_____			
2. MANUFACTURING PLANNING & CONTROL SYSTEMS	☐	☐	☐
Computerized Financial Systems	☐	☐	☐
Computerized Order Entry/Inventory Control	☐	☐	☐
Computer-Aided Process Planning	☐	☐	☐
Manufacturing Resource Planning Systems (MRP)	☐	☐	☐
Automated Shop Floor Data Collection	☐	☐	☐
Computerized Decision Support Systems	☐	☐	☐
Computerized Maintenance Planning & Control	☐	☐	☐
Any Others? _____	☐	☐	☐
_____			
3. MANUFACTURING PROCESS TECHNOLOGIES	☐	☐	☐
Computerized Process Control Systems	☐	☐	☐
Computer-Aided Inspection & Testing	☐	☐	☐
Robotic Applications	☐	☐	☐
Flexible Manufacturing Technologies			
Computer Integrated Manufacturing (CIM)			
Any Others? _____			
4. MATERIALS HANDLING TECHNOLOGIES	☐	☐	☐
Automatic Bulk Handlers/Feeder Systems	☐	☐	☐
Automated Conveyor/Vehicle Systems	☐	☐	☐
Automated Storage & Retrieval	☐	☐	☐
Computer Controlled Conveyor/Vehicles	☐	☐	☐
Automated Warehouse	☐	☐	☐
Any Others? _____	☐	☐	☐
_____			
5. TELECOMMUNICATIONS TECHNOLOGIES	☐	☐	☐
Facsimile (FAX) Link: HO/Plants	☐	☐	☐
Computer Link: HO/Plant(s)	☐	☐	☐
Computer Link: Suppliers/Customers	☐	☐	☐
Any Others? _____	☐	☐	☐
_____			
6. OTHER TECHNOLOGIES	☐	☐	☐
_____	☐	☐	☐
_____			
HAVE/WILL NOT ADOPT ANY NEW TECHNOLOGIES IN THIS PERIOD	☐	☐	☐

4. FORCES DRIVING THE FIRM'S NEED FOR NEW TECHNOLOGIES OVER THE NEXT 10 YEARS

4a. What is the **single most important driving factor** in your firm's internal or external environment which could accelerate your **firm's need to adopt** these new technologies over the next 10 years in ONTARIO?

4b. What is the **second most important factor** likely to accelerate your firm's need to adopt these new technologies?

4c. And what is the **third most important** factor?

5. FACTORS AFFECTING THE FIRM'S RATE OF TECHNOLOGY ADOPTION OVER THE NEXT 10 YEARS

5a. What is the **single most important factor** in your firm's internal or external environment that could slow down the speed at which your firm will adopt these new technologies over the next 10 years in ONTARIO?

5b. What is the **second most important** factor that could slow down your firm's adoption of these new technologies?

5c. And what is the **third most** important factor?

6. IMPACT OF TECHNOLOGY ON OCCUPATIONS OVER THE NEXT 10 YEARS

The following questions attempt to determine impacts on specific occupations you expect to be caused by the adoption of new technologies in your firm over the next 10 years in ONTARIO.

6a. Please indicate the **occupations** in which your firm is likely to have an **oversupply of people** over the next 10 years as a result of the adoption of these new technologies. Record your answer on Chart 6, opposite, under column 6A.

6b. Please indicate the **occupations** in which you expect your firm will have a **shortage of the skills** required to cope with these new technologies. Record your answer on Chart 6, under column 6B.

(SIC 165)

CHART 6
IMPACT OF TECHNOLOGIES ON SELECTED OCCUPATIONS
IN YOUR FIRM OVER THE NEXT 10 YEARS

	6a OCCUPATIONS WITH AN OVERSUPPLY OF SKILLS	6b OCCUPATIONS WITH A SHORTAGE OF THE REQUIRED SKILLS
MANAGERIAL, ADMINISTRATIVE & RELATED	☐	☐
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers	☐	☐
• Engineering Technicians & Technologists	☐	☐
• Systems Analysts & Computer Programmers	☐	☐
PROCESSING	☐	☐
MACHINING		
• Tool & Die Making & Mold Makers	☐	☐
• Machinist & Machine Tool Setting-Up	☐	☐
FABRICATING & ASSEMBLING		
• Supervisors: Plastics Fabricating	☐	☐
• Moulding: Plastics	☐	☐
• Fabricating: Plastics	☐	☐
MATERIAL HANDLING	☐	☐
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____	☐	☐
_____	☐	☐
_____	☐	☐

(SIC 165)

7. ACTIONS TO DEAL WITH OVERSUPPLY OF SKILLS IN FIRM OVER NEXT 10 YEARS

The following questions relate to the actions your firm will likely take to deal with the oversupply of people in your firm resulting from the adoption of these new technologies in ONTARIO.

7a. For each occupation with a potential oversupply of skills (as you indicated in Q.6a), please identify the **steps** your firm will likely take that will **affect the largest number of people** in that occupation. Record your answers on Chart 7, opposite, under column 7a.

In answering this and the following question, please consider the possible actions listed below as well as any other possible action not in the list but that your firm is likely to take.

Possible Actions

- Attrition
- Early Retirement
- Layoffs
- Relocation (geographic)
- Shorter hours/work week
- Job sharing
- Change from full-time to part-time
- Retraining
- Lateral transfer
- Upgrading
- Downgrading
- Etc. etc.,

7b. Again, for each of these occupations, identify the step your firm may take that will affect the **second largest number of people** in that occupation. Record on Chart 7, under column 7b.

(SIC 165)

CHART 7

STEPS FIRM WILL LIKELY TAKE
TO DEAL WITH OVERSUPPLY OF SKILLS OVER NEXT 10 YEARS

OCCUPATIONS	7a STEPS THAT WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	7b STEPS THAT WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
PROCESSING		
MACHINING		
• Tool & Die Making & Mold Makers		
• Machinist & Machine Tool Setting-Up		
FABRICATING & ASSEMBLING		
• Supervisors: Plastics Fabricating		
• Moulding: Plastics		
• Fabricating: Plastics		
MATERIAL HANDLING AND RELATED		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

8. STEPS TO ACQUIRE THE NEW SKILL REQUIREMENTS OVER THE NEXT 10 YEARS

The following questions are intended to identify the most likely steps your firm may take to acquire the new skill requirements associated with the new technologies over the next 10 years in ONTARIO.

8a. Please indicate, for each occupation with a potential shortage of the new skill requirements (as you indicated in Q6b), the **step** your firm will likely take that will **affect the largest number of people** in that occupation. Record your answers on Chart 8, column 8a.

Please consider the possible actions listed below as well as any other action (not listed) that your firm is likely to take.

Likely Steps

- Retraining
- Relocation
- Upgrading
- Increased overtime of firm's skilled people
- Recruiting full-time skilled people
- Recruiting part-time skilled people
- Contracting work out
- Etc., etc...

8b. Please indicate, for each occupation, the **step** your firm may take that will affect the **second largest number of people** in that occupation. Record your answers in column 8b.

(SIC 165)

CHART 8

STEPS FIRM WILL TAKE
OVER NEXT 10 YEARS TO ACQUIRE THE NEW SKILL REQUIREMENTS

OCCUPATIONS	8a STEP WHICH WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	8b STEP WHICH WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
PROCESSING		
MACHINING		
• Tool & Die Making & Mold Makers		
• Machinist & Machine Tool Setting-Up		
FABRICATING & ASSEMBLING		
• Supervisors: Plastics Fabricating		
• Moulding: Plastics		
• Fabricating: Plastics		
MATERIAL HANDLING AND RELATED		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

(SIC 165)

9. NATURE OF IMPACT ON SKILLS AND JOB CONTENT OVER THE NEXT TEN YEARS

The following questions are meant to identify the nature of the impact on selected occupations in ONTARIO.

9a. For selected occupations in your firm, please indicate how the new technologies will affect each in their daily work. That is, will their daily work require greater skill (+), less skill (-), or about the same skill (0) as they currently require. Record your answers on Chart 9, opposite, under Column 9a.

9b. Please indicate whether the new skills they require will demand more time (+), less time (-), or about the same time (0) to achieve the proficiency that they will need. Record your answers on Chart 9, column 9b.

9c. Please indicate whether, in using these new technologies, these occupations will require more knowledge (+) of the company's operations, less knowledge (-), or about the same (0) amount of knowledge as is currently required to perform their daily tasks. Record your answers on Chart 9, under 9c.

(SIC 165)

CHART 9
IMPACT OF TECHNOLOGY ON SKILL LEVELS AND JOB CONTENT

	9a SKILLS REQUIRED (+, -, 0)	9b TIME TO ACHIEVE PROFICIENCY (+, -, 0)	9c KNOWLEDGE OF COMPANY'S OPERATIONS (+, -, 0)	COMMENTS
MANAGERIAL, ADMINISTRATIVE, & RELATED	___	___	___	_____
NATURAL SCIENCE, ENGINEERING & MATHEMATICS				
• Engineers	___	___	___	_____
• Engineering Technicians & Technologists	___	___	___	_____
• Systems Analysts & Computer Programmers	___	___	___	_____
PROCESSING	___	___	___	_____
MACHINING				
• Tool & Die Making & Mold Makers	___	___	___	_____
• Machinist & Machine Tool Setting-Up	___	___	___	_____
FABRICATING & ASSEMBLING				
• Supervisors: Plastics	___	___	___	_____
• Moulding: Plastics	___	___	___	_____
• Fabricating: Plastics	___	___	___	_____
MATERIAL HANDLING AND RELATED	___	___	___	_____
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?				
_____	___	___	___	_____
_____	___	___	___	_____
_____	___	___	___	_____

(SIC 165)

10. TRAINING/RETRAINING

These questions are about the current and future importance of **training and retraining** in your organization.

10a. Please indicate what were your firm's total training costs as a percent of total labour costs in **1981**. Record your answer on Chart 10, line 10a.

Training costs include the costs of internally or externally provided training programs, classroom and on-the-job workshops, vouchers or tuition credits, provided by your firm, which are intended to train employees to perform their jobs or to retrain employees to assume new or alternate jobs. Labour costs include all wages, salaries and benefits. (e.g., $\frac{\text{Total Training Costs}}{\text{Total Labour Costs}} \times 100 = 1.0\%$)

10b. Please indicate what your firm's total training costs as a percent of total labour costs will be in **1984** (to year end). Record your answer on line 10b.

10c. What do you estimate for **1985**, (line 10c)?

10d. What do you estimate it will be in **1990**, (line 10d)?

10e. What do you estimate it will be in **1995**, (line 10e)?

10f. For each year on Chart 10, (line 10a to 10e), please indicate what percent of total training costs in each year have or will go towards training people to adapt to the new technologies.

(SIC 165)

CHART 10

TRAINING COSTS OF FIRM

			As a Percent of Total Labour Costs	Percent of Total Training Costs Directly Related to New Technologies
10a.	1981?	Actual	___%	___%
10b.	1984?	Estimate	___%	___%
10c.	1985?	Estimate	___%	___%
10d.	1990?	Estimate	___%	___%
10e.	1995?	Estimate	___%	___%

(SIC 165)

11. FIRM'S EMPLOYMENT TRENDS

In this section, we would like to determine how the firm's employment levels in ONTARIO are likely to change over the next 10 years.

11a. To begin, considering all possible factors in your firm's internal and external environment, what is the **single most important factor** which will have an impact on your firm's level of employment in ONTARIO over the next 10 years? _____

_____

11b. The **second most important factor?** _____

_____

11c. The **third most important factor?** _____

_____

11d. Please indicate **total employees** (includes full-time, temporary, contract, casual, seasonal and part-time employment) in your organization in ONTARIO for **1971, 1981 and 1984** from your employment records. Record your answers on Chart 11, column 11d.

Please estimate future total employment in your organization in ONTARIO for **1985, 1990 and 1995.**

11e. Please indicate the **percent** of your total employment in ONTARIO that are **part-time** employees (i.e., less than normal full work week), for **1981 and 1984.** Record your answers on Chart 11, column 11e.

Also in column 11e, please estimate part-time employees as a percent of total employees in ONTARIO for **1985, 1990 and 1995.**

(SIC 165)

11f. Please translate your total ONTARIO employment (include full-time, part-time, casual, temporary, seasonal) into a full-time equivalent (**F.T.E.**) figure for your firm for **1981 and 1984** in column 11f.

Also in column 11f, please estimate total employment in terms of a full-time equivalent (F.T.E.) for **1985, 1990 and 1995.**

By **F.T.E.** we mean a normal, full, work week for a normal, full year. F.T.E. can be measured in a variety of ways depending on whatever is normal for your firm or industry. For example, if expressed in hours of work per year one FTE might range from 1750 to 2000 hours of work a year depending on the length of the normal work week (e.g., 35 hours/week x 50 weeks = 1750 hours, 40 hours/week x 50 weeks = 2000 hours.)

CHART 11

FIRM'S EMPLOYMENT TRENDS IN ONTARIO

	11d TOTAL EMPLOYMENT IN ONTARIO	11e PART-TIME EMPLOYEES AS A % OF TOTAL EMPLOYMENT	11f TOTAL EMPLOYMENT IN FULL-TIME EQUIVALENT (F.T.E.)
Actual Figures			
1971?	_____		
1981?	_____	_____ %	_____ FTE
1984?	_____	_____ %	_____ FTE
Your Estimates			
1985?	_____	_____ %	_____ FTE
1990?	_____	_____ %	_____ FTE
1995?	_____	_____ %	_____ FTE

(SIC 165)

12. CHANGES IN EMPLOYMENT STRUCTURE

This section is intended to measure the changes in the employment structure of your firm in ONTARIO between 1981 and 1995.

12a. Please indicate the actual percentage share of <u>each</u> occupation listed as a percent of your firm's total employment in ONTARIO in 1981. Record your answer on Chart 12, column 12a.

12b. Please indicate the actual percentage share of <u>each</u> selected occupation listed as a percent of your firm's total employment in ONTARIO in 1984. Record your answer in column 12b.

12c. Please estimate the same for each selected occupation in 1985. Record in column 12c.

12d. Please estimate the same for each selected occupation in 1990. Record in column 12d.

12e. Please estimate the same for each selected occupation in 1995. Record in column 12e.

(SIC 165)

CHART 12
TRENDS IN FIRM'S OCCUPATIONAL STRUCTURE
BETWEEN 1981 AND 1995

	OCCUPATIONS AS A PERCENT OF TOTAL EMPLOYMENT OF THE FIRM IN ONTARIO					
	12a Actual 1981	12b Actual 1984	12c Estimate 1985	12d Estimate 1990	12e Estimate 1995	
	%	%	%	%	%	
MANAGERIAL, ADMINISTRATIVE, & RELATED						1*
NATURAL SCIENCE, ENGINEERING & MATHEMATICS						2*
• Engineers						
• Engineering Technicians & Technologists						
• Systems Analysts & Computer Programmers						
• All Other Science & Mathematics (not listed above)						
PROCESSING						3*
MACHINING						4*
• Tool & Die Making & Mold Makers						
• Machinist & Machine Tool Setting-Up						
• All Other Machining (not listed above)						
FABRICATING, ASSEMBLING & REPAIRING						5*
• Supervisors: Plastics Fabricating						
• Moulding: Plastics						
• Fabricating: Plastics						
• All Other Fabricating, Assembling, & Repairing (not listed above)						
MATERIAL HANDLING AND RELATED						6*
ALL OTHER OCCUPATIONS						7*
* **FIRM'S TOTAL EMPLOYMENT IN ONTARIO** (1+2+3+4+5+6+7 = 100%)	100%	100%	100%	100%	100%	

(SIC 165)

13. EMPLOYMENT STRUCTURE BY SEX

The following questions refer to your firm's employment in ONTARIO by sex for each specific occupation listed in Chart 13.

13a. Please provide the percentage split between male and female of your employees in ONTARIO by each occupation in 1981. Record your answer on Chart 13, column 13a.

13b. Please provide the percentage split between male and female employees by occupation in ONTARIO in 1984. Record your answer in Column 13b.

(SIC 165)

CHART 13

EMPLOYMENT STRUCTURE BY SEX AND OCCUPATION IN ONTARIO

	13a 1981 EMPLOYMENT MALE	FEMALE	TOTAL	13b 1984 EMPLOYMENT MALE	FEMALE	TOTAL
MANAGERIAL, ADMINISTRATIVE & RELATED	___% +	___%	=100%	___% +	___%	=100%
NATURAL SCIENCES, ENGINEERING & MATHEMATICS						
• Engineers	___% +	___%	=100%	___% +	___%	=100%
• Engineering Technicians & Technologists	___% +	___%	=100%	___% +	___%	=100%
• Systems Analysts & Computer Programmers	___% +	___%	=100%	___% +	___%	=100%
PROCESSING	___% +	___%	=100%	___% +	___%	=100%
MACHINING						
• Tool & Die Making & Mold Makers	___% +	___%	=100%	___% +	___%	=100%
• Machinist & Machine Tool Setting-Up	___% +	___%	=100%	___% +	___%	=100%
FABRICATING ASSEMBLING & REPAIRING						
• Supervisors: Plastics	___% +	___%	=100%	___% +	___%	=100%
• Moulding: Plastics	___% +	___%	=100%	___% +	___%	=100%
• Fabricating: Plastics	___% +	___%	=100%	___% +	___%	=100%
MATERIAL HANDLING AND RELATED	___% +	___%	=100%	___% +	___%	=100%
FIRM'S TOTAL EMPLOYEES IN ONTARIO	___% +	___%	=100%	___% +	___%	=100%

(SIC 165)

14. ORGANIZED LABOUR IN YOUR FIRM IN ONTARIO

14a. Does your firm have any workers in ONTARIO covered by a collective labour agreement(s)?

Yes ☐ No ☐ **If no, go on to Question 14c.**

14b. If yes, what percent of your firm's total employment in ONTARIO is currently (1984) unionized?

____%

14c. What percent of your firm's total employment in ONTARIO do you estimate will be unionized by 1985, 1990 and by 1995?

- 1985? ____%
- 1990? ____%
- 1995? ____%

14d. If you expect an increase in the percent of total employment that will be unionized, please indicate the specific occupational groups within which you expect the increase will take place.

_____

_____

15. ORGANIZED LABOUR AND TECHNOLOGY CHANGE

If any of the employees in your firm in ONTARIO are represented by a union, please answer the following series of questions. If none of the workers in your firm in ONTARIO are unionized, please go on to Question 16, p. 22.

15a. Please indicate the name of the union(s) in your firm in ONTARIO. Record your answers on Chart 15, on line 15a.

15b. On line 15b, please indicate the number of the firm's employees in ONTARIO in each union.

15c. On line 15c, indicate the worker groups in your firm the union(s) represents.

15d. On line 15d, check ☑ if the contract(s) has a technology change clause(s).

15e. On line 15e, check ☑ if the technology change clause(s) covers any of the following:

- Notice/Disclosure
- Consultation/Participation
- Joint Technology Change Committee
- Job Security
- Seniority
- Other (please specify).

15f. On line 15f, indicate whether the clause(s) is effectively administered. If your answer is "NO", please explain your answer.

CHART 15

ORGANIZED LABOUR IN ONTARIO

	(name of union)	(name of union)	(name of union)
15a. Name of Unions in Firm			
15b. Number of Firm's Employees in Each Union			
15c. Worker Groups Represented by Each Union			
15d. Does Union(s) Contract(s) Have a Technology Change Clause(s)?			
YES	☐	☐	☐
NO	☐	☐	☐
15e. Check ☑ if Technology Change Clause(s) Includes:			
• Notice/Disclosure	☐	☐	☐
• Consultation/Participation	☐	☐	☐
• Joint Technology Change Committee	☐	☐	☐
• Job Security	☐	☐	☐
• Seniority	☐	☐	☐
• Other _____ (specify)	☐	☐	☐
15f. Is the Clause Effectively Administered?			
YES	☐	☐	☐
NO	☐	☐	☐
If 'NO', explain			

(SIC 165)

15g. In general, what has been the union's position on the adoption of new technologies in your firm? Please explain.

_____

_____

_____

_____

_____

(SIC 165)

16. THE NATURE OF WORKER INVOLVEMENT IN THE PROCESS OF TECHNOLOGY ADOPTION

The following questions are on the nature of the **relationship between workers and management** in your firm as decisions are made on the adoption of new technology.

16a. Does your firm have a formal mechanism for worker participation in any of the following? Please Check ☑ Yes or No

	YES	NO
• Setting production and/or sales targets:		
- at company level?	☐	☐
- at division/plant level?	☐	☐
- at department/area level?	☐	☐
- at working group level?	☐	☐
• Improving productivity/quality?	☐	☐
• Adoption of new technology?	☐	☐

16b. In your opinion, to what extent and how should management involve workers in decisions regarding the adoption of new technologies? Please comment.

_____
_____
_____
_____
_____
_____

(SIC 165)

17. FUTURE CAPITAL INVESTMENTS

17a. Please indicate how much, **in today's dollars**, your firm plans to spend on **construction of structures and buildings** in ONTARIO over the period **1985 to 1990** and over the period **1991 to 1995**. Record your answer on Chart 17, column 17a.

17b. What percent of this spending can be directly attributed to the adoption of **new technologies**? Record under column 17b.

17c. Would you indicate how much, **in today's dollars**, your firm plans to spend on **machinery and equipment** over the period **1985 to 1990** and over the period **1991 to 1995** in ONTARIO. Record under column 17c.

17d. What percent of this spending on **machinery and equipment** will be for **new technologies**? Record under column 17d.

17e. Please indicate what criterion your firm will likely use to justify the financial investment in the new technologies.

Pay-back period ☐ _____ If Yes, how long?

Return on investment ☐ _____ If Yes, what rate?

Other _____ ☐ _____ Please elaborate
(specify)

17f. Considering now your total capital investment in new technology over the next 10 years, what percent will be funded through internal funds and what percent will be funded through external funds?

Internal funds ___%
External funds ___%
100%

(SIC 165)

CHART 17

CAPITAL INVESTMENT PLANS

IN ONTARIO

	INVESTMENT IN STRUCTURES & BUILDINGS		INVESTMENT IN MACHINERY & EQUIPMENT	
	17a	17b	17c	17d
	IN TODAY'S DOLLARS (In Thousands $)	% DIRECTLY RELATED TO NEW TECHNOLOGY	IN TODAY'S DOLLARS (In Thousands $)	% FOR NEW TECHNOLOGY
1985 to 1990?	$_____	_____%	$_____	_____%
1991 to 1995?	$_____	_____%	$_____	_____%

(SIC 165)

18. PLANNING FOR CHANGES IN TECHNOLOGY

These questions ask about your firm's plans for adopting new technologies in ONTARIO.

18a. Does your firm currently have a long-term strategic plan?

Yes ☐ No ☐

18b. Does your firm have a plan to deal with future human resource needs?

Yes ☐ No ☐ **If no, go to Question 18d.**

18c. Up to what year has your firm planned for its human resource needs?

_____

(WRITE IN YEAR)

18d. Does your firm have a capital investment plan dealing with the adoption of new technologies?

Yes ☐ No ☐ **If no, go to Question 19. on p. 25.**

18e. Up to what year has your firm planned for its capital requirements?

_____

(WRITE IN YEAR)

18f. On a scale of 1 to 5, please indicate to what extent these two plans (capital investment and human resource plans) are integrated.

(Please circle answer)

NOT AT ALL INTEGRATED	1	2	3	4	5	HIGHLY INTEGRATED

(SIC 165)

19. Please indicate below any other comments on the issue of employment and new technology you wish to make.

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

(SIC 165)

PLASTIC PROCESSING INDUSTRY

Number of Firms and Unions Responding by Question

Question		Firms	Unions	Question		Firms	Unions
Question 1	1982-1983	11	1	Question 12	a,b,c,d,e	12	1
	1983-1984	11	1				
	1984-1985	11	1				
	1985-1990	11	1	Question 13		*	*
	1990-1995	11	1				
Question 2		*	*	Question 14	a	13	4
					b	8	3
					c	13	4
Question 3	a,b,c	12	2		d	1	0
Question 4	a,b,c	13	3	Question 15	a	8	4
					b	7	4
					c	*	*
Question 5	a,b,c	13	3		d	8	4
					e	3	1
					f	3	1
Question 6	a,b	13	3		g	5	4
Question 7	a	11	2	Question 16	a	13	4
	b	9	2		b	11	3
Question 8	a	12	3	Question 17	a	11	1
	b	9	3		b	9	0
					c	12	1
					d	11	1
Question 9	a	13	3		e	12	1
	b	12	3		f	10	1
	c	13	3				
				Question 18	a	12	1
Question 10	a,b,c,d,e	12	2		b	12	1
					c	8	1
Question 11	a,b,c,	12	3		d	11	0
	d	12	2		e	8	1
	e	12	2		f	10	1
	f	12	1				

* Data not used and therefore, number of responses not reported.

APPENDIX C

RELIABILITY OF THE SAMPLE

SAMPLE RELIABILITY

The sample reliability is summarized with other sample and population characteristics in "Table 1". The sample was selected as a three stage stratified random sample. The purpose of this stratification was to reduce the error variance in the measurement of organization size by increasing the homogeneity of each group of organizations within each strata.

The first stage consisted in creating two industry sectors (i.e. manufacturing and services). The second stage involved dividing up each industry sector into nine and fourteen industrial sub-classes respectively and according to Standard Industrial Classification codes (see Table 1). The third stage was to further stratify each SIC into three more homogeneous size groups:

Manufacturing Sector		Service Sector
Small	20- 99 employees	20-199 employees
Medium	100-499 employees	200-999 employees
Large	500+ employees	1,000+ employees

Exceptions to these three size groupings are as follows:

SECTOR		ORGANIZATION SIZE EXCLUSION
Manufacturing Sector		
291	Iron & Steel Mills	less than 500
321	Aircraft & Aircraft Parts	less than 50
Service Sector		
701	Banks and Trusts	less than 50
721	General and Life Insurance	less than 50
735	Insurance Brokers	less than 50
909	Federal Government	less than 500
931	Provincial Government	less than 200
951	Local Government	less than 500

Overall, the sample yields a relatively high reliability level in reflecting the employment level of those sectors surveyed. For instance for the Plastic Processing Industry the sample yields a minimum confidence level of about 99 percent with an associated allowable error of 11 percent. That is, we would expect that the estimated employment level for the sector has a 99 percent chance of being within $\pm$ 5 percent of the actual employment level found in the frame. Or stated alternatively, if 100 independent random samples were drawn, in 99 of these samples we would expect to have an estimated employment level within $\pm$ 5 percent of the actual employment level found in the sample frame.

TABLE 1: SUMMARY OF MANUFACTURING INDUSTRIES

SAMPLE FRAME AND SAMPLE

Code	SIC NAME	UNIVERSE		SAMPLE FRAME				SAMPLE				
		Number of Firms	Number of Employees[1]	Min. Size Cut Off	Number of Firms	Number of Employees[2]	Share of Universe	Number of Firms	Number of Unions	Number of Employees	Reliability Level (min.)	Allowable Error
											Percent	
1	Iron and Steel Mills	17	41,603	500	7	39,900	96	3	1	21,833	90	23
4	Metal Stamping, Pressing and Coating Industry	185	17,730	20	145	17,200	97	14	3	4,507	99	5
6	Hardware, Tool and Cutlery Manufacturing	225	12,826	20	135	11,500	90	11	6	1,489	94	5
9	Miscellaneous Metal Fabricating Industries	132	12,235	20	110	12,000	98	11	6	2,694	99	5
5	Miscellaneous Machinery and Equipment Manufacturers	304	36,904	20	262	36,500	99	12	3	3,972	99	5
8	Office and Store Machinery Manufacturers	29	10,485	20	29	9,800	93	7	0	11,814	99	5
5	Communications Equipment Manufacturers	67	28,090	20	65	27,800	99	12	2	14,946	90	11
1	Aircraft and Aircraft Parts Manufacturers	22	12,732	50	17	12,000	94	10	5	11,737	95	7
5	Plastic Processing	196	19,218	20	169	18,800	98	13	4	2,400	99	5

Source: Census of Manufacturing, 1982, Statistics Canada, Catalogue No. 31-203.

Rounded to nearest 100.

APPENDIX D

HISTORICAL TABLES

TABLE D.1

END USES OF MAJOR PLASTIC RESINS AND MATERIALS

Resin	Production in 1983 in '000 tons		End Uses
Polyethylene Low Density	427	50%	Film - for bags and wrappings (e.g., garbage bags, food)
High Density	194	15%	Injection moulding for food containers, toys, housewares
		10%	Blowmoulding for containers for household and industrial chemicals
		7%	Drain tile
		18%	Other, including coatings, wire and cable and pipe
Polypropylene	122	41%	Injection moulding for automotive parts and containers (e.g., paint pails)
		39%	Fibres for carpet backing, diapers, sanitary products, filters and packaging
		11%	Film wrappings for tobacco, gum, snack foods
		9%	Other (for blow moulding and extrusions)
Polyvinyl Chloride	243	33%	Pipe and fittings
		16%	Sheet and moulding
		14%	Siding for houses
		10%	Wire and cable
		12%	Calendering and coating

TABLE D.1 (Cont'd)

END USES OF MAJOR PLASTIC RESINS AND MATERIALS

Resin	Production in 1983 in '000 tons		End Uses
		4%	Film and packaging
		6%	Flooring
		2%	Phonograph records
		2%	Bottles
Polystyrene & Styrene Copolymers	132	N/A	Small and large home appliances
		"	Food packaging (foam and sheet for cups and containers)
		"	Laboratory equipment
		"	Cabinetry and housings for electronics
Other	304		
Total	1,422		

N/A - Not available.

NOTE: Percentage details may not add to totals due to rounding.

SOURCE: The Society of the Plastics Industry, Outlook Conference, 1983, and Canadian Plastics Statistical Year Book, 1984.

TABLE D.2

SELECTED PLASTIC PROCESSING COMPANIES* IN ONTARIO
BY MAIN PRODUCT LINE

	Number of Employees
Automotive Parts	
ABC Plastic Moulding	100-199
Davidson Rubber Company Ltd.	200-499
Mold-Masters Ltd.	100-199
North American Plastics Co. Ltd.	200-499
PV Trim Ltd.	200-499
Plaza Fibreglass Mfg. Ltd.	100-199
Somerville Belkin Industries Ltd.	50-99
Reeves Bros. Canada Limited	200-499
Rockwell International of Canada Ltd.	100-199
Woodbridge Foam Corporation	200-499
Construction Materials, including pipe	
Building Products of Canada Ltd. (2 plants)	150-289
Daymond Limited (2 plants)	120-248
Domtar Inc.	100-199
Dow Chemical Canada Ltd.	200-499
Multi-Fittings Ltd.	100-199
Protective Plastics Ltd. (3 plants)	170-347
Scepter Manufacturing Co. Ltd. (4 plants)	270-546
Consumer Products	
Aladdin Western Export Corp.	50-99
Canadian Thermos Products Ltd.	100-199
Dart Products National Ltd. (2 plants)	120-248
Moldex Limited	100-199
Rubbermaid (Canada) Ltd.	200-499
Somerville Belkin Industries Ltd.	100-199
The Geo. Cluthe Manufacturing Co. Ltd.	100-199
Packaging and Containers	
Canada Plastic Containers Ltd.	100-199
Consumers Glass Company Limited	100-199
Du Pont of Canada Inc.	200-499
Kord Products Ltd.	100-199

TABLE D.2 (Cont'd)

SELECTED PLASTIC PROCESSING COMPANIES* IN ONTARIO
BY MAIN PRODUCT LINE

	Number of Employees
Packaging and Containers (Cont'd)	
Leco Inc.	100-199
Nor Baker Industries Limited (2 plants)	220-548
Norseman Plastics Limited	100-199
Polytainers Limited	100-199
Portion Packaging Limited	200-499
Somerville Belkin Industries Ltd.	100-199
Union Carbide Canada Limited	200-499
Custom Moulders	
Maple Leaf Plastics Corporation	100-199
Midland Industries Ltd.	100-199
Morval-Durofoam Limited	200-499
Norseman Plastics Limited	100-199
Protective Plastics Ltd. (3 plants)	170-347
Toronto Plastics Limited	200-499

* Selected on the basis that at least one plant operated by the firm has more than 100 employees.

SOURCES: Canadian Trade Index and Statistics Canada, Plastics Industries, Cat. No. 46-222.

TABLE D.3

PLASTIC PROCESSING (SIC 165)
ONTARIO
1971 - 1984
Current Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	278	291	320	343	335	340	337	423	452	452	454	454		
CAPACITY UTILIZATION RATE, CANADA	83.7	86.6	90.8	83.9	72.2	78.3	81.3	83.9	90.3	78.6	80.1	66.7	75.1	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	325.9	383.9	477.6	620.2	606.4	691.0	783.8	985.2	1239.6	1360.9	1538.2	1533.3		
MANUFACTURING VALUE ADDED	166.2	197.4	239.5	311.6	289.2	313.9	358.6	456.9	558.1	594.6	677.4	678.0		
WAGES & SALARIES	84.4	100.7	124.9	140.7	146.1	172.4	194.1	237.7	270.1	295.8	323.0	341.5		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	10,945	12,110	13,954	13,891	13,353	13,939	14,295	16,390	16,860	16,134	16,082	15,289		
ADMINISTRATIVE STAFF	2,415	2,681	2,957	3,074	2,745	2,901	3,153	3,482	3,784	4,402	4,025	3,929		
TOTAL	13,360	14,791	16,911	16,965	16,098	16,840	17,448	19,872	20,644	20,536	20,107	19,218		
CAPITAL INVESTMENT, CANADA ($ Million)														
CONSTRUCTION	5.7	6.1	9.5	9.5	7.9	7.9	7.2	10.9	26.4	14.4	13.4	7.9	11.2	9.8
MACHINERY & EQUIPMENT	19.3	24.7	34.9	39.2	35.6	32.4	37.6	44.4	65.7	64.3	62.9	62.2	67.5	104.5
TOTAL	25.0	30.8	44.4	48.7	43.5	40.3	44.8	55.3	92.1	78.7	76.3	70.1	78.7	114.3
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	12,444	13,344	14,161	18,369	17,964	18,639	20,554	22,994	27,032	28,953	33,691	35,280		
VALUE ADDED/$ LABOUR	1.97	1.96	1.92	2.21	1.98	1.82	1.85	1.92	2.07	2.01	2.10	1.99		
VALUE ADDED/$ LABOUR (United States)	2.21	2.27	2.35	2.49	2.29	2.40	2.40	2.34	2.41	2.34	2.38	2.41		
EXPORTS ($ Million)	8.1	10.3	16.1	19.0	16.6	20.4	27.5	36.5	57.8	70.8	91.4	110.2	128.8	
IMPORTS ($ Million)	46.7	57.6	73.4	100.3	98.5	117.4	137.3	157.9	190.8	206.7	250.6	239.5	285.6	
TRADE BALANCE ($ Million)	(38.6)	(47.3)	(57.3)	(81.3)	(81.9)	(97.0)	(109.8)	(121.4)	(132.9)	(135.9)	(159.2)	(129.3)	(156.8)	
NORMALIZED TRADE BALANCE	(0.705)	(0.696)	(0.640)	(0.682)	(0.711)	(0.704)	(0.666)	(0.625)	(0.535)	(0.490)	(0.466)	(0.370)	(0.378)	

( ) indicates deficit

NOTE: Capacity Utilization Rate shown is for Rubber and Plastics Products industries.

SOURCE: Statistics Canada, MANUFACTURING INDUSTRIES OF CANADA: NATIONAL AND PROVINCIAL AREAS, Cat. No. 31-203; CAPACITY UTILIZATION RATES IN CANADIAN MANUFACTURING, Cat. No. 31-003; and External Trade Division, Special Runs. United States data supplied by Coopers & Lybrand. Calculations by Economics Practice, Currie, Coopers & Lybrand.

TABLE D.4

PLASTIC PROCESSING (SIC 165)
ONTARIO
1971 - 1984
PER CENT CHANGE
Current Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	4.7	10.0	7.2	-2.3	1.5	-0.9	25.5	6.9	0.0	0.4	0.0		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	17.8	24.4	29.9	-2.2	14.0	13.4	25.7	25.8	9.8	13.0	-0.3		
MANUFACTURING VALUE ADDED	18.7	21.3	30.1	-7.2	8.5	14.3	27.4	22.1	6.5	13.9	0.1		
WAGES & SALARIES	19.3	24.0	12.7	3.8	18.0	12.6	22.5	13.6	9.5	9.2	5.7		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	10.6	15.2	-0.5	-3.9	4.4	2.6	14.7	2.9	-4.3	-0.3	-4.9		
ADMINISTRATIVE STAFF	11.0	10.3	4.0	-10.7	5.7	8.7	10.4	8.7	16.3	-8.6	-2.4		
TOTAL	10.7	14.3	0.3	-5.1	4.6	3.6	13.9	3.9	-0.5	-2.1	-4.4		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	7.0	55.7	0.0	-16.8	0.0	-8.9	51.4	142.2	-45.5	-6.9	-41.0	41.8	-12.5
MACHINERY & EQUIPMENT	28.0	41.3	12.3	-9.2	-9.0	16.0	18.1	48.0	-2.1	-2.2	-1.1	8.5	54.8
TOTAL	23.2	44.2	9.7	-10.7	-7.4	11.2	23.4	66.5	-14.5	-3.0	-8.1	12.3	45.2
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	7.2	6.1	29.7	-2.2	3.8	10.3	11.9	17.6	7.1	16.4	4.7		
EXPORTS	27.4	56.2	17.8	-12.3	22.7	34.7	32.6	58.5	22.4	29.1	20.6	16.8	
IMPORTS	23.3	27.4	36.6	-1.7	19.2	16.9	15.0	20.8	8.4	21.2	-4.4	19.2	

SOURCE: Calculated from Table D.3 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.5

PLASTIC PROCESSING (SIC 165)
ONTARIO
1971 - 1984
Constant 1971 Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	278	291	320	343	335	340	337	423	452	452	454	454		
CAPACITY UTILIZATION RATE, CANADA	83.7	86.6	90.8	83.9	72.2	78.3	81.3	83.9	90.3	78.6	80.1	66.7	75.1	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	325.9	385.5	466.4	491.8	439.1	485.2	521.9	616.9	685.2	658.7	691.0	653.9		
MANUFACTURING VALUE ADDED	166.2	190.3	227.2	256.5	229.5	249.9	272.7	322.5	357.7	335.4	344.9	323.9		
WAGES & SALARIES	84.4	96.8	111.9	113.3	106.4	116.1	120.9	137.7	143.2	141.6	138.4	132.0		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	10,945	12,110	13,954	13,891	13,353	13,939	14,295	16,390	16,860	16,134	16,082	15,289		
ADMINISTRATIVE STAFF	2,415	2,681	2,957	3,074	2,745	2,901	3,153	3,482	3,784	4,402	4,025	3,929		
TOTAL	13,360	14,791	16,911	16,965	16,098	16,840	17,448	19,872	20,644	20,536	20,107	19,218		
CAPITAL INVESTMENT CANADA ($ Million)														
CONSTRUCTION	5.7	5.8	8.3	7.1	5.3	5.0	4.3	6.0	13.3	6.5	5.4	2.9	3.9	3.3
MACHINERY & EQUIPMENT	19.3	24.1	32.6	32.2	25.6	22.1	23.5	24.8	33.4	29.6	26.0	23.8	25.0	36.8
TOTAL	25.0	29.9	40.9	39.3	30.9	27.1	27.8	30.8	46.7	36.1	31.4	26.7	28.9	40.1
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	12,444	12,868	13,436	15,119	14,257	14,840	15,630	16,227	17,328	16,330	17,154	16,856		

NOTE: Calculations based on unrounded data where available. Shipments data deflated by the Industry Selling Price Index for SIC 165; Value Added deflated by the Implicit Price Index for Gross Domestic Product for SIC 165; Wages and Salaries deflated by the Implicit Price Index for Personal Expenditure on Consumer Goods and Services; and Capital Investment deflated by the Implicit Price Indexes for Business Non-Residential Construction and Machinery and Equipment.

SOURCE: Publications as outlined in Table D.3. Also Statistics Canada, INDUSTRY PRICE INDEXES, Cat. No. 62-011; GROSS DOMESTIC PRODUCT BY INDUSTRY, Cat. No. 61-005; and NATIONAL INCOME AND EXPENDITURE ACCOUNTS, Cat. No. 13-201. Calculations and forecast deflators by Economics Practice, Currie, Coopers & Lybrand.

TABLE D.6

PLASTIC PROCESSING (SIC 165)
ONTARIO
1971 - 1984
PER CENT CHANGE
Constant 1971 Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	4.7	10.0	7.2	-2.3	1.5	-0.9	25.5	6.9	0.0	0.4	0.0		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	18.3	21.0	5.5	-10.7	10.5	7.5	18.2	11.1	-3.9	4.9	-5.4		
MANUFACTURING VALUE ADDED	14.5	19.4	12.9	-10.5	8.9	9.1	18.2	10.9	-6.3	2.9	-6.1		
WAGES & SALARIES	14.7	15.6	1.3	-6.1	9.1	4.2	13.8	4.0	-1.1	-2.3	-4.6		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	10.6	15.2	-0.5	-3.9	4.4	2.6	14.7	2.9	-4.3	-0.3	-4.9		
ADMINISTRATIVE STAFF	11.0	10.3	4.0	-10.7	5.7	8.7	10.4	8.7	16.3	-8.6	-2.4		
TOTAL	10.7	14.3	0.3	-5.1	4.6	3.6	13.9	3.9	-0.5	-2.1	-4.4		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	1.8	43.1	-14.5	-25.4	-5.7	-14.0	39.5	121.7	-51.1	-16.9	-46.3	34.5	-15.4
MACHINERY & EQUIPMENT	24.9	35.3	-1.2	-20.5	-13.7	6.3	5.5	34.7	-11.4	-12.2	-8.5	5.0	47.2
TOTAL	19.6	36.8	-3.9	-21.4	-12.3	2.6	10.8	51.6	-22.7	-13.0	-15.0	8.2	38.8
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	3.4	4.4	12.5	-5.7	4.1	5.3	3.8	6.8	-5.8	5.0	-1.7		

SOURCE: Calculated from Table D.5 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.7

OCCUPATIONAL INDICATORS: PLASTIC PROCESSING INDUSTRY

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
I	TOTAL INDUSTRY	22,120	6.4
II	TWO DIGIT LEVEL		
	MACHINING AND RELATED	1,175	4.0
	PROCESSING	2,725	4.1
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	810	7.7
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	8,775	8.4
	MATERIAL HANDLING AND RELATED	1,740	8.7
	MANAGERIAL, ADMINISTRATIVE AND RELATED	1,525	10.4
III	FOUR DIGIT LEVEL		
	MACHINING AND RELATED		
	Machinist and Machine-Tool Setting Up	225	0.5
	Tool- and Die-Making	145	1.1
	Filing, Grinding, Buffing, Cleaning and Polishing n.e.c.	130	6.4
	Patternmakers and Mouldmakers, n.e.c.	175	7.5
	Welding and Flame Cutting	100	9.6
	TOTAL	1,175	4.0

TABLE D.7 (Cont'd)

OCCUPATIONAL INDICATORS: PLASTIC PROCESSING INDUSTRY

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
PROCESSING		
Crushing and Grinding	135	(1.4)
Coating and Calendering	240	1.6
Inspecting, Testing and Sampling	180	1.8
Labouring and other Elemental Work	130	2.2
Processing, n.e.c.	1,255	4.7
Foremen	230	6.3
Mixing and Blending	255	7.4
TOTAL	2,725	4.1
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
Industrial Engineers	105	1.6
Physical Sciences, Technologists and Technicians	110	3.9
Chemical Engineers	110	6.2
Architectural and Engineering Technologists and Technicians	235	21.0
TOTAL	810	7.7
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING		
Other Product Fabricating, Assembling and Repairing n.e.c.	200	(1.4)
Labouring and other Elemental Work	830	3.6
Paper Product Fabricating and Assembling	115	7.7
Moulding	1,830	8.3
Painting and Decorating	210	8.8
Foremen	1,290	9.9
Inspecting, Testing, Grading and Sampling	420	11.2

TABLE D.7 (Cont'd)

OCCUPATIONAL INDICATORS: PLASTIC PROCESSING INDUSTRY

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING (Cont'd)		
Fabricating, Assembling and Repairing	2,140	13.0
Industrial, Farm and Construction Machinery Mechanics and Repairmen	440	14.4
Bonding and Cementing	345	15.7
Cutting and Finishing	285	15.9
Electrical and Related Equipment Installing and Repairing	100	20.9
TOTAL	8,775	8.4
MATERIAL-HANDLING AND RELATED		
Packaging, n.e.c.	1,275	8.8
Equipment Operators, n.e.c.	190	12.2
Other Material-Handling and Related, n.e.c.	115	12.6
TOTAL	1,740	8.7
MANAGERIAL, ADMINISTRATIVE AND RELATED		
General Managers and Other Senior Officials	215	3.3
Accountants, Auditors and Other Financial Officers	205	6.4
Other Managers and Administrators, n.e.c.	180	16.2
Sales and Advertising Management	160	20.4
Production Management	495	21.6
TOTAL	1,525	10.4

( ) Indicates decline
NOTE: Details do not add to totals as all occupations are not included.
SOURCE: Census Data, Ontario Ministry of Labour

TABLE D.8

OCCUPATIONAL INDICATORS: PLASTIC PROCESSING INDUSTRY

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL		NUMBER OF JOBS GAINED BY FEMALES
	1981	1971	1981	1971-1981
I. TOTAL INDUSTRY	9,005	39.1	40.7	4,345
II. TWO DIGIT LEVEL				
MACHINING AND RELATED	255	24.5	21.7	60
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	125	7.8	15.4	95
MANAGERIAL, ADMINISTRATIVE AND RELATED	265	12.4	17.4	195
PROCESSING	925	38.5	33.9	220
MATERIAL HANDLING AND RELATED	1,150	63.6	66.1	670
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	3,870	45.4	44.1	2,100
III. FOUR DIGIT LEVEL				
MACHINING AND RELATED				
Machinist and Machine-Tool Setting Up	35	27.9	15.6	(25)
Tool- and Die-Making	5	0.0	3.4	5
Welding and Flame Cutting	25	12.5	25.0	20
Filing, Grinding, Buffing, Cleaning and Polishing, n.e.c.	65	64.3	50.0	20
Patternmakers and Mouldmakers, n.e.c.	35	0.0	20.0	35
TOTAL	255	24.5	21.7	60

TABLE D.8 (Cont'd)

OCCUPATIONAL INDICATORS: PLASTIC PROCESSING INDUSTRY

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
Physical Sciences, Technologists and Technicians	10	20.0	9.1	(5)
Industrial Engineers	5	11.1	4.8	(5)
Chemical Engineers	15	0.0	13.6	15
Architectural and Engineering Technologists and Technicians	70	14.3	29.8	65
TOTAL	125	7.8	15.4	95
MANAGERIAL, ADMINISTRATIVE AND RELATED				
General Managers and Other Senior Officials	0	3.2	0.0	(5)
Sales and Advertising Management	10	0.0	6.3	10
Production Management	40	7.1	8.1	35
Accountants, Auditors and Other Financial Officers	60	13.6	29.3	45
Other Managers and Administrators, n.e.c.	80	62.5	44.4	55
TOTAL	265	12.4	17.4	195

TABLE D.8 (Cont'd)

OCCUPATIONAL INDICATORS: PLASTIC PROCESSING INDUSTRY

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
PROCESSING				
Crushing and Grinding	25	35.5	18.5	(30)
Inspecting, Testing and Sampling	105	73.3	58.3	(5)
Labouring and Other Elemental Work	65	47.6	50.0	15
Mixing and Blending	30	8.0	11.8	20
Coating and Calendering	110	41.5	45.8	25
Foremen	40	4.0	17.4	35
Processing, n.e.c.	465	44.3	37.1	115
TOTAL	925	38.5	33.9	220
MATERIAL HANDLING AND RELATED				
Equipment Operators, n.e.c.	15	8.3	7.9	10
Other Material-Handling and Related, n.e.c.	25	0.0	21.7	25
Packaging, n.e.c.	1,075	83.6	84.3	615
TOTAL	1,150	63.6	66.1	670

TABLE D.8 (Cont'd)

OCCUPATIONAL INDICATORS: PLASTIC PROCESSING INDUSTRY

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING				
Electrical and Related Equipment Installing and Repairing	0	33.3	0.0	(5)
Industrial, Farm and Construction Machinery Mechanics and Repairmen	15	4.3	3.4	10
Other Product Fabricating, Assembling and Repairing, n.e.c.	90	30.4	45.0	20
Paper Product Fabricating and Assembling	55	54.5	47.8	25
Labouring and Other Elemental Work	410	57.3	49.4	75
Bonding and Cementing	115	43.8	33.3	80
Painting and Decorating	155	83.3	73.8	80
Cutting and Finishing	155	61.5	54.4	115
Foremen	200	4.0	15.5	180
Inspecting, Testing, Grading and Sampling	260	51.7	61.9	185
Moulding	915	58.8	50.0	430
Fabricating, Assembling and Repairing	1,295	56.3	60.5	940
TOTAL	3,870	45.4	44.1	2,100

( ) Indicates decline.

NOTE: Females employed in 1981 is calculated from percent of total. Details do not add to totals as all occupations are not included.

SOURCE: Census data supplied by Ontario Ministry of Labour.

FINAL REPORT AND APPENDICES OF THE ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

Final Report — Employment and New Technology

Appendices:

1. Labour Market Trends in Ontario, 1950-1980
2. Occupational Employment Trends in Ontario, 1971-1981
3. Emerging New Technology, 1985-95: Framework for a Survey of Firms
4. Employment and New Technology in Ontario's Manufacturing Sector: A Summary of Selected Industries
5. Employment and New Technology in the Iron and Steel Industry
6. Employment and New Technology in the Metal Fabricating Industry
7. Employment and New Technology in the Machinery and Equipment Industry
8. Employment and New Technology in the Aircraft and Aircraft Parts Industry
9. Employment and New Technology in the Communications Equipment Industry
10. Employment and New Technology in the Office, Store and Business Machine Industry
11. Employment and New Technology in the Plastic Processing Industry
12. Employment and New Technology in Ontario's Service Sector: A Summary of Selected Industries
13. Employment and New Technology in the Chartered Banks and Trust Industry
14. Employment and New Technology in the Insurance Industry
15. Employment and New Technology in the Government Services Industry
16. Employment and New Technology in the Telecommunications Industry
17. Employment and New Technology in the Retail Trade Industry
18. Employment and New Technology in the Computer Services and Management Consulting Industry
19. Industry-Sector and Occupational Employment in Ontario, 1985-1995
20. Technological Change, Productivity, and Employment: Studies of the Overall Economy


11
11
11
11
11
11
11
11
11
11
11
11